# Student Experiences and Educational Outcomes of Southeast Asian Female Secondary School Students in the United States
## -A Critical Quantitative Intersectionality Analysis-

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## Abstract

The purpose of this study is to examine the relationship between Southeast Asian female students' multiple identities (race or ethnicity, gender, and socioeconomic class [SES]) and their schooling experiences and educational outcomes. It also seeks to identify school organizational characteristics that mediate the effects of the convergence of multiple marginalized identities on Southeast Asian female students' experiences and educational outcomes. This study used restricted-use data from High School Longitudinal Studies 2009 provided by the National Center for Education Statistics, and employed multiple regression, logistic regression, and linear mixed effect modeling.

Math achievement scores of Southeast Asian students were significantly higher than those of other race or ethnicity groups, except Other Asian/Pacific Islanders, regardless of gender. However, Southeast Asian females' intention to pursue higher education was significantly lower than that of Southeast Asian males as well as being the lowest among all female students. Furthermore, the influence of SES on Southeast Asian female students' math achievement scores was not statistically different from the average impact of SES on math achievement scores for all students.

In terms of students' schooling experiences, Southeast Asian female students are less likely to hold gender stereotypes regarding males' superior math abilities than are other race or ethnic groups. In addition, Southeast Asian female students perceived a higher degree of positive interactions with math teachers (i.e., teacher's expectation, teacher's treatment in terms of respect, and teacher's fairness). Focusing on math teachers' teacher quality measures (i.e., years of teaching experience, a graduate degree), Southeast Asian students' math teachers did not have significantly

different teacher quality compared to that of their white counterparts. Finally, the effect of SES on the quality of interactions with math teachers was positive for Southeast Asian female students. This pattern was not unique to Southeast Asian high school girls; that is, higher SES had a similarly positive association on the quality of interactions with teachers for other race or ethnicity groups, except Hispanic students. This study also found that the school organizational characteristics used in this study did not mediate or differentiate the intersectionalities related to Southeast Asian female students. In other words, the patterns described above held regardless of schooling context.

Although the model minority stereotype toward Asian students suggests that they are the most likely to pursue higher education, this study reveals the limits of the myth. It demonstrated that Southeast Asian females have the lowest intention (among females) to pursue higher education even though they had good schooling experiences, earned among the highest grades in high school, and did not consider boys to be better at math. The findings reveal a larger systemic failure to consider the specificities within the Asian population, which limits the provision of adequate support for Southeast Asian females to realize their full potential through their future academic careers. Implications for policy and leadership are discussed.

**Keywords**: Intersectionality, Southeast Asian Females, Race or Ethnicity, Gender, Socioeconomic Status, STEM Education

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# CHAPTER I: INTRODUCTION

## Background of this Study

Educational equity and social justice are important goals that policymakers and educational leaders have been attempting to achieve in schooling around the world. The United Nations Educational, Scientific and Cultural Organization (2009), for example, emphasized educational equity and inclusive education as "a process of strengthening the capacity of the education system to reach out to all leaners [that] can thus be understood as a key strategy to achieve E[ducation for all]" (p. 8). In the interest of equitable educational opportunities for all students, the U.S. Department of Education (2016) emphasized that students' identities (e.g., race or ethnicity, gender, disability, national origin) should not limit their educational opportunities. Policies that focus on equity are a critical step in realizing a just society in which everyone has appropriate educational opportunities to realize his or her full potential.

Despite these enormous efforts from policymakers and educational leaders, current educational reform and social movements for educational equity and justice are typically too narrowly focused. That is, current education policies to support historically marginalized students are often based on only one of their identities. By not considering the complex impact of having multiple marginalized identities, educational policies aimed at realizing equity and social justice are often limited in challenging injustices, inequities, and oppression faced by students who belong to multiple marginalized student groups. For example, regarding the Obama administration's education initiative to realize racial justice in American education, McClain (2014) argued that these racial justice initiatives still ignore gender, thereby excluding girls and women from these initiatives. Similarly, Capper (2015) criticized

Universal Design for Learning because it addresses only a singular identity (i.e., students with disabilities) without considering specific needs of students with other marginalized identities (e.g., students of color, students who are English Language learners). Furthermore, Collins and Bilge (2016) criticized diversity policy initiatives in science, technology, engineering, and mathematics (STEM) targeting only girls or only students of color. Collins and Bilge argued that "parsing out race, gender, and class as separate entities narrows the ability of pipeline metaphors to solve the problems [students with multiple marginalized identities] encounter" (p. 176). Ignoring aspects of multiple identities in education policies inhibits students' from being fully recognized because the wholeness of their being is not fully recognized. Policymakers and leaders should care about the multiplicative influences of students' marginalized identities. Acknowledging the problem of narrow perspectives in educational reform becomes the critical motivation for this study.

**Equity and Intersectionality**

To critically understand the issues of inequalities and injustice in American society based on multiple identities, scholars have used the term *intersectionality* (e.g., Collins & Bilge, 2016; Crenshaw, 1991; Dantley, Beachum, & McCray, 2008; Hancock, 2007; McCall, 2005; Wilson, 2013; Yuval-Davis, 2006). Originating from Kimberlé Crenshaw's use of the term from streets converging in an intersection, intersectionality has been used to understand mutually reinforcing multiple identities such as race or ethnicity, gender, and socioeconomic status (SES). Intersectional thinkers define the intersectionality concept as the various ways in which multiple identities interact to shape the dimensions of the experiences of individuals. For example, Brewer (1993) argued that race/SES/gender identities are "complex social relations involving multiple sites of oppression, occurring in conjunctive, disjunctive,

and contradictory ways to generate a system of race, color, gender, and sexual, and class oppression" (as cited in Brewer, 2003).

The concept, framework, and theory of intersectionality are important and useful for realizing the current limited equity reform in the United States. This is because students' experiences in school are more complex than most scholarly exploration indicates; it is not simply an additive issue where singular student identities can be added together to estimate a holistic impact. Rather, marginalized identities intersect in multiplicative ways, making it more challenging for policy makers and educational leaders to address adequately the achievement and other opportunity gaps experienced by students. Thus, the intersectionality perspective is useful as it reveals that dimensions of inequality are not mutually exclusive and that social problems, policies, and practices are the product of intermingling race or ethnicity, SES, and/or gender identities. This perspective renders visible the power relations and the structural oppression and exclusion of marginalized people, and it builds interdisciplinary knowledge for more nuanced and complex understandings of and changes in the lives of groups of marginalized students.

## Purpose and Significance of this Study

Based on the theoretical foundation of the intersectionality framework, the main purposes of this study are threefold. First, it aims to examine the relationship between students' multiple marginalized identities (race or ethnicity, gender, and SES) and their schooling experiences and educational outcomes. Second, it seeks to identify characteristics in school organizations that can mediate or differentiate the patterns of influence of multiple identities on students' experiences and academic outcomes. Third, it intends to provide policy suggestions to accomplish

comprehensive equity reform for all students inclusive of their race or ethnicity, gender, and SES.

To accomplish these purposes, this study focuses on female students of color—particularly Southeast Asian female students-- experiences and performance in science, technology, engineering, and mathematics (STEM) in schools in the U.S. The decision to focus on Southeast Asian (e.g., Cambodian, Vietnamese, Hmong, Thai, Lao) female students stems from the fact that this group of students has often been marginalized in both education policy and research perspectives (Covarrubias & Liou, 2014; Ngo, 2009; Teranishi, 2007; Zia, 2006). It is important to describe Asian populations more fully because overall examinations of Asian population as one category are likely to miss the variation within this group. For example, students from Cambodian, Vietnamese, and Hmong communities often differ from those from Chinese, Korean, and Japanese communities. According to U.S. Census data, more than half of Asian-Americans (51.5%) have a bachelor's degree or higher. However, only 15.3% of Hmong-Americans, 18% of Cambodian-Americans, and 28.4% of Vietnamese-Americans have a bachelor's degree or higher (Vega, 2015). The perpetuated stereotypes that Asian students are high performers, good at science and math, and hardworking (i.e., model minority stereotype) can create devastating results for low-performing Asian students. Furthermore, this study focused on female students as a marginalized identity within gender, because males have traditionally dominated STEM occupations in the United States (Riegle-Crumb & King, 2010) and girls typically underperform boys in STEM subjects in U.S. elementary and middle schools (e.g., Quinn & Cooc, 2015). Finally, this study focuses on math and science subjects, reflecting the emphasis on "scientific literacy" among the U.S. general public by leaders in education, politics, and business (as cited in Quinn and

Cooc, 2015). The underrepresentation of women and people of color in STEM (National Center for Education Statistics, 2012) also provided the motivation for the analysis.

Among the three identities (race or ethnicity, gender, and SES), this study distinguishes between race and ethnicity because lived experiences of Asian Americans are diverse based on their different ethnicities (Teranishi, 2007; Gillborn, Warmington & Demack, 2018). On the one hand, race is a social construct and "an unstable and de-centered complex of social meanings constantly being transformed by political struggle" (Omi & Winant, 2014, p. 19). In addition, race is "a social construct that has both self-prescribed and externally ascribed meaning"; thus, race in the United States has had "more social and political meaning than biological reality" (Howard, 2010, p. 96). Ethnicity, on the other hand, refers to "traditions, customs, activities, beliefs, and practices that pertain to a particular group of people who see themselves and are seen by others as having distinct cultural features, a separate history, and a specific sociocultural identity" (Smedley & Smedley, 2012, p. 29). Based on the concept of ethnicity, disaggregating Asian American students into smaller groups by ethnicity can differentiate Southeast Asian students' educational experiences originating from specific sociocultural backgrounds within a singular Asian racial category. Indeed, all three identities in this study represent socially constructed and hierarchically arranged categories. In addition, the concepts of these social categorizations are not innate nor simple biological fixation, but constructions that are "a set of fully social relationships" (Apple, 2001, p. 204). Based on the interpretation of these identities as associational inferences, rather than as attributes or causal variables (Zuberi, 2001), this study operationalizes these identities to

address with a critical lens injustices and inequality that Southeast Asian females, an underexplored student population, may experience.

The significance of this study for deepening our knowledge of and theorizing on intersectionality are as follows: First, this study addresses the problem of overreliance on test scores identified in the literature. Some scholars have argued that studies that use only reading or math achievement scores to examine educational inequalities are problematic because they do not consider other important aspects contributing to school inequality (e.g., Howard, 2010). In particular, Howard (2010) criticized the limitation of using traditional measures of student achievement in "offering a complete picture of the performance and potential of students in general, and culturally diverse students in particular" (p. 12). Thus, by examining multiple dimensions of students' experiences and characteristics, this study can provide a clearer and more nuanced picture of multiple barriers and advantages related to students' short- and long-term outcomes than by using only measures of student achievement. Furthermore, the exploration of distinct characteristics and inequalities on students' value systems, barriers, and advantages can provide important information to explain why the schooling experiences of Southeast Asian female students across different social classes differ from those of other students.

A common weakness of intersectionality studies is the absence of nationally relevant and generalizable findings. The reason that few empirical studies comprehensively focus on the multiplicities of students' identities might be the challenge entailed in quantifying these intersections when examining a nationally representative sample and the difficulty in generalizing findings when describing the rich details of a particular case. An empirical study using a U.S. national sample to identity the intersectionality of student identities in education can be an important

step in filling in knowledge gaps and solidifying the theoretical framework of intersectionality. Stage (2007) rightly highlighted the importance of empirical evidence from critical quantitative studies in policy discussion, stating that

> [a critical quantitative study] use[s] data to represent educational processes and outcomes on a large scale to reveal inequities and to identify social or institutional perpetuation of systematic inequities in such processes and outcomes. (p. 10)

As a critical quantitative research, this study can provide policy implications by answering critical questions related to the complexity of students' experiences, particularly for Southeast Asian female students in the United States.

The motivating questions driving this study are as follows: (1) How are multiple marginalized identities associated with Southeast Asian female students' experiences and educational outcomes? (2) How do associations among the intersectionality of race or ethnicity, gender, socioeconomic status (SES), and Southeast Asian female students' experiences and outcomes differ across school organizational characteristics? The first question attempts to identify the uniqueness of Southeast Asian female students' experiences and how these experiences are related to their short- and long-term educational outcomes. In addition, the examination of associations between multiple identities and students' experiences and educational outcomes challenges narrow perspectives in research, which often ignore the fact that one student identity may simultaneously interact with other identities held by that student (e.g., gender, SES).

The second question emerged to identify school factors that can mediate the effects of the convergence of multiple marginalized identities (students' race or ethnicity, gender, and SES) on Southeast Asian female students' experiences. Núñez

(2014) proposed a conceptual map of intersectionality based on three hierarchical frameworks (i.e., micro-, meso-, and macro-level structure) to comprehensively understand structures of domination and power dynamics immortalizing educational inequity. According to her conceptual map, the micro-level structure covers individuals' multiple identities creating different experiences. The macro-level structure indicates historicity (Anthias, 2013), focusing on the role of history (e.g., economic and historical conditions) in creating broader dynamics. Between these two levels of structures—macro and micro— Núñez (2014) introduced a meso-level structure indicating "societal processes and organizational practices that shape the creation, perpetuation, salience, and nature of social categories" (p. 52) through institutional norms, attitudes, or behaviors. Among these three levels of structure, this study employs the meso-level lens to examine the role of school organizations in shaping diverse spectrums of students' experiences and academic outcomes.

This study comprises five sections. Chapter I describes the critical problem of monolithic perspective regarding multiple identities in education policy and research. It describes the purposes of this study and potential contribution to literature based on the problem statement.

Chapter II explores foundations of concepts and theory as well as core premises of intersectionality. Chapter II also reviews the literature examining various factors related to students' schooling experiences and outcomes in the short and long term by focusing on a myriad of student identities. In addition, the latter half of Chapter II reviews the literature focusing on school organizational characteristics that might influence the association between intersecting multiple identities and students' experiences and outcomes. It also reviews literature focusing on Southeast Asian students' experiences and outcomes. Based on this review, Chapter II closes

with a discussion of knowledge gaps in the literature and key research questions that emerged.

Chapter III specifically describes the research design and data sources used in this study. This chapter describes the High School Longitudinal Study of 2009 (HSLS:09) of the National Center for Education Statistics (NCES) and provides a description of the key variables and modeling processes used in identifying the intersectionality of marginalized identities in U.S. schools. Chapter IV presents the results of the analyses. Finally, Chapter V concludes with a summation of the results and specific implications for researchers, practitioners, and educational leaders. It also offers guidelines for future research.

# CHAPTER II: LITERATURE REVIEW

This study specifically addresses current narrow perspectives on equity and social justice in research and education policy. In addition, researchers and policymakers typically assume that Asian students as a single category will have better experiences and higher performance than will other racial or ethnic minority students (i.e., black and Hispanic). Based on the assumption that Asian students are a single undifferentiated group, scholars often do not investigate the diverse experiences and outcomes of specific populations within Asian student groups (Covarrubias & Liou, 2014; Museus, 2009; Museus & Griffin, 2011; Teranishi, 2007). Therefore, this study will examine the multifaceted impacts of Southeast Asian female students' marginalized identities. Furthermore, this study seeks to identify school organizational characteristics that mediate the effects of the convergence of multiple marginalized identities on student experiences and educational outcomes.

To accomplish the purposes of this study, this literature review contains six sections. The first three sections discuss the intersectionality of race or ethnicity, gender, and SES. The first section begins with a historical overview and foundations of concepts and theory of intersectionality; the second section reviews extant literature to identify core premises and the use of intersectionality in order to reveal how intersecting identities influence students' experiences and outcomes; and the third section reviews intersectionality research in the field of education that uses qualitative and quantitative methodology. The fourth section discusses studies examining the association between students' experiences and outcomes in K-12 education. In addition, the latter half of the fourth section reviews the literature

focusing on school organizational characteristics that might influence the association between intersecting multiple identities and students' experiences and outcomes. The fifth section reviews literature focusing on Southeast Asian students' experiences and outcomes. The final section discusses the research questions that emerge from the review of literature.

## Historical Overview and Foundations of Intersectionality

Scholars in the last three decades have explored race or ethnicity, gender, and socioeconomic status (SES) as critical factors in diversifying and often perpetuating inequalities in people's lives. Although some scholars have investigated race or ethnicity, gender, or SES separately, other scholars have endeavored to focus on race or ethnicity, gender, and SES simultaneously based on additive or multiplicative approaches. Intersectionality scholars mainly utilize the multiplicative approach to explain the nuances and complexities of the lives of people originating from multiple marginalized identities. This chapter begins with a historical overview illustrating how intersectionality scholars moved from the additive to the multiplicative approach; it introduces theoretical and conceptual foundations of intersectionality. The next section encapsulates the essential premises and diverse uses of intersectionality in the academy and social media. The final section reviews intersectionality studies in education using qualitative and quantitative approaches.

### Historical Overview

The foundational concepts of intersectionality have their origins in black feminist scholarship and activism, which challenge the converging systems of power (e.g., racism, sexism, colonialism, capitalism) that black women experience. Black feminist scholars emphasize that lives of women of color (mainly black women) become distinct from those of white women or black men due to inextricably bound

pressures from sexism and racism (e.g., Collins, 1998; Crenshaw, 1991; Dill, 1983; Hooks, 1992, 2000). In particular, Collins (1998), as a black feminist scholar, articulated the experiences of black women through the lens of violence. Furthermore, Collins proposed a basis for the concept of simultaneity, indicating the dynamic processes in which race or ethnicity, gender, and SES operate when influencing people's lives, and the subsequent theory of social identities (e.g., race or ethnicity, gender, SES, and sexual orientation). The black feminist intellectuals from the late 1960s to 1980s contributed to the amplification of the essential ideas of intersectionality, which also appeared in critical texts, such as Toni Cade Bambara's *The black Woman* and the Combahee River Collective's *A black Feminist Statement*.

Based on the foundations of black feminist theory, Kimberlé Crenshaw (1991) created the umbrella term *intersectionality* to build a coalition among the study areas of race or ethnicity, SES, and gender as an interdisciplinary endeavor and to include diverse social identities and context beyond black women (Dhamoon, 2010). Crenshaw (1991), a critical legal scholar, illustrated a pattern in how court cases, mainly from a single axis framework, had failed to address the lives of black women experiencing mutually enforced discrimination and oppression based on race or ethnicity and gender. In addition to the concepts of simultaneity that black feminism scholars emphasize, Crenshaw further identified the essential ideas of relationality, power relations, and social context. Relationality denotes the interconnectedness among race or ethnicity, gender, and SES, embracing a "both/and" frame and focusing on analyzing the interconnections among multiple identities. Based on the relationality among multiple identities, intersectionality attempts to understand the power relations of racism, sexism, capitalism, and heterosexism through "a lens of mutual construction" instead of as "a static entity"

(Collins & Bilge, 2016, p. 26). Finally, diverse social identities do not possess the same meaning across different social contexts (e.g., organization, nation).

## Foundations of Intersectionality

Intersectionality explores the complexities of diverse social identities, including race or ethnicity, gender, SES, sexual orientation, indigeneity, and immigration status. As intersectionality seeks to explore multiple identities, its theoretical foundations are based on various theories exploring different social identities (e.g., critical race theory, indigenous feminism, and postcolonial theory) and concepts (e.g., hybridity, middle ground, border crosser, and code switching). The subsequent sections briefly introduce the interconnection of theories and concepts of intersectionality.

**Theoretical foundations of intersectionality**. Intersectionality researchers have emphasized the importance of power in perpetuating the structures of oppression and discrimination. In addition, intersectionality attempts to provide foundations for the pursuit of social justice. These two emphases are thoroughly tied to the narratives of critical race theory (CRT), post-colonial theory, and indigenous theory that are typically used to challenge unjust power relations embedded in social practices based on different social locations. In particular, CRT scholars argue that invisible racialized and structured barriers in society lead people of color to be "oppressed, distorted, ignored, silenced, destroyed, appropriated, commodified, and marginalized" (Bell, 1995, p. 901). Thus, the works of CRT scholars are relevant for intersectionality research to understand the significance of racism and challenge for "fortifying white power" (Bell, 1995, p. 901). Intersectionality considers how the intersection of race or ethnicity with other identities (e.g., gender, social class, sexual orientation) is deeply rooted in the CRT movement (Crenshaw, 2011).

Post-colonial theorists explore the interplay of power related to colonialism, white supremacy, and patriarchy in line with their exploration of power in intersectionality. In particular, postcolonial theorists contend that "both the 'metropolis' and the 'colony' were deeply altered by the colonial process and that these articulating histories have a mutually constitutive role in the present" (Brah & Phoenix, 2004, p. 83). These scholars often criticize the essentialist and totalized way of understanding the lives of indigenous people with multiple social locations and identities. The post-colonial theories' disruption of modernist theoretical traditions in the totalized understanding of lives of people with multiple identities fits well with the theoretical foundations of intersectionality. In particular, Crenshaw (2001) highlighted the importance of oppression stemming from colonialism in creating multiple layered oppressions in the lives of indigenous/native people. Postcolonial theory's criticism of totalized ways of understanding correspondingly challenges the undifferentiated understanding of lives of Southeast Asian people, which is a critical motivation of this study.

In line with the theoretical foundations of postcolonial theorists, indigenous scholars have also challenged the legitimacy of a colonialized and white settler society. Educational researchers using indigenous theory have often emphasized anti-colonial practice and perspective within school organizations as well as globalizing and internationalizing trends in educational reform. In particular, Fitzgerald (2006) condemned colonized school organizations that "serve to homogenize and standardize and simultaneously segregate, stratify and marginalize" (p. 203). Fitzgerald further decried a ubiquitous way of understanding leadership. She criticized the assumption that the leadership of women of color will be similar to that of white males or females as problematic due to its lack of attention to issues of

power and differences across and between race or ethnicity and gender. Similar to the concept of multiplicity in intersectionality and black feminism, Fitzgerald (2003) argued that Maori women leaders, as an indigenous population in New Zealand, are experiencing multiple subordinations from gender, race or ethnicity, and colonization. As these studies demonstrate, the theoretical foundations of CRT, post-colonialist, and indigenous theories not only fit with intersectionality, but also nourish the groundwork of intersectionality by illuminating different systematic oppression and privilege based on race or ethnicity, colonization, and indigeneity. Furthermore, it is of crucial political importance to recognize and include the experiences of colonialized and indigenous populations whom policymakers and scholars often ignore in policy discussions and research in intersectionality analyses (Yuval-Davis, 2006).

**Conceptual foundations of intersectionality.** The consideration of multiple identities creates important concepts related to intersectionality—namely, hybridity, borderland, middle ground, and code switching. First, cultural theorists have theorized identity through the term of hybridity to conceptualize identity as incomplete, contextual, and discursive construct (e.g., Bhabha, 1994, Hall, 1990). In particular, Bhabha (1994) disputed notions of fixed identity and underscored that the meaning of identity creates a space for translation and negotiation, thereby enabling other identities to emerge. Thus, Bhabha argued that identities are shaped in and come out from this space of translation and negotiation, creating "neither one nor the other but something else besides, in-between" (p. 219). In this regard, the concept of hybridity suggests important implications for intersectionality; that is, identity work is not singular, but "multiply constructed across different, often intersecting and antagonistic, discourses, practices and positions" (Hall, 1996, p. 4). Poststructuralists

also strengthen the concept of hybridity in identities by challenging the essentialists' assumption about the clear distinctions and binary categorizations among identities. Instead of using the term *hybridity*, Ngo (2009) utilized the term *ambivalence* to better describe the multiple and fragmented identities that immigrant students in the United States have.

Similar to the concept of hybridity, the concept of borderland speaks to ambiguity, fluidity, and nuanced characteristics of identities. Gloria Anzaldúa's (1987) *Borderland/LaFrontera* conceptualized a borderland as *mestiza* (in-between space) and described it as "unstable, unpredictable, precarious, always-in-transition space boundaries" (Anzaldúa, 2009, p. 243). The concept of borderland also suggests that people living along a border are experiencing greatly different access to resources and power, forcing them to confront power struggles (Callis, 2014). Thus, scholars have used the concept of borderland to illustrate an ideological, political, or cultural breakdown of the categories in social locations and identities instead of merely describing the physical breakdown of two countries (e.g., the United States and Mexico, South Korea and North Korea). The concept of borderland, which reveals the ambiguity and nuanced properties of two identities is closely in line with the approach of this study in opposing universalism and creating a "willingness to relinquish privilege, engagement with others, and movement toward change" (Robers & Jesudason, 2013, p. 315). In addition, the concept of border in relation to intersectionality has been used to provide an understanding of the lives of people with complex, multiple, and in-between identities.

Similarly, the concept of the middle ground (White, 1991) describes the spaces of multiple identities created by complex relationships of power. The middle ground was used to describe the relationships between Native Americans and French

colonizers in White's (1991) study. White defined the middle ground as "the place in between: in between cultures, peoples, and in between empires and the nonstate world of villagers. … On the middle ground, diverse peoples adjust their differences through what amounts to a process of creative, and often expedient, misunderstandings" (p. x). Scholars have utilized the concept of the middle ground to depict experiences for marginalized (e.g., indigenous, Native Americans) people in the U.S. living within in-between worlds as well as to illustrate ideologies and practices from white, male, and English speakers as a dominant culture (DeLeon, 2010). Similar to the concept of borderland, the concept of middle ground suggests that people living in the spaces between cultures and identities often experience dynamic inequality and social division in terms of their relationships with each other.

Finally, sociolinguists have utilized the concept of code switching to move away from the idea of an essentialist and monolithic approach in identities. The concept of code switching corresponds with intersectionality and a core idea of this study by describing the complexity and fluidity in living experiences of people (particularly in the use of language) with multiple identities. In particular, sociolinguists typically refer to code switching when describing a phenomenon in which bilingual speakers use two or more languages in the same conversation. Scholars argue that bilingual speakers often use code switching as a strategy to obtain a sense of solidarity and shared power as well as social, political, and economic goals (e.g., Pavlenko & Blackledge, 2004). In addition, people of color tend to utilize code switching as a tool for accommodating institutional norms and regulations when a group or organization (e.g., school) expresses signs of discomfort related to differences in identities (Cross, Strauss, & Fhagen-Smith, 1999). The concept of code switching corresponds with intersectionality when considering

identities as being never unified and singular, but fractured, "often intersecting and antagonistic, discourses, practices and positions" (Hall, 1996, p. 4).

## Core Premises of Intersectionality

Based on the theoretical and conceptual foundations presented in the previous section, intersectionality proposes four core premises:

1. The influence of race or ethnicity, gender, and SES on the lives of people cannot be separated (simultaneity);
2. The relationships among race or ethnicity, gender, and SES are multiplicative (multiplicity);
3. Race or ethnicity, gender, and SES constitute interlocking, mutually constructing or intersecting systems of power (power relations); and
4. Intersecting power relations vary across different social contexts (social context).

The subsequent sections specifically discuss these four core premises of intersectionality. These four core premises guide models for quantitative analysis employed in this study, exploring the relationship between intersectionality of multiple identities and Southeast Asian students' schooling experiences and educational outcomes.

### Simultaneity

The premise of simultaneity in intersectionality argues that race or ethnicity, gender, and SES are present simultaneously in dynamic processes in which multiple identities operate when influencing lives of people. From the example of black female slaves in the previous paragraph, Landry (2007) further conceptualized simultaneity as follows:

> We may be able to emotionally (or financially, or …) bear up to the negative consequences of our race or our gender or our class; but suffering negative consequences in all three areas simultaneously (as sometimes occurs) may be experienced as debilitating or threatening to push us off the edge (poor, black, and female), expressed in laments of "I can't take any more of this." (p. 13)

Thus, simultaneity requires scholars to include all three identities when they examine social phenomena related to social locations or identities in the strictest sense. However, some scholars interpret simultaneity in a less strict way, concluding that all three identities may not be equally critical and one identity may have prominence over another identity in a given time or place (e.g., Collins, 1993). In particular, simultaneity indicates that one of the three identities may be more salient based on a situation (King, 1988) or one of the three identities may be experienced differently based on the individual's social location (Zinn & Dill, 1996). In addition, due to the difficulty of collecting data for all three identities, researchers often reasonably omit an identity of race or ethnicity, gender, or SES.

Despite the importance of simultaneity, educational researchers in the United States have typically explored the effects of diverse identities on inequalities in student experiences and achievement separately. Based on the studies focusing on one identity and educational inequality, we know much about single underlying mechanisms and reasons for educational inequalities. The following sections review the literature illustrating issues of educational inequalities based on only one identity and suggest implications and criticisms related to the simultaneity of intersectionality.

**Studies focusing on only race or ethnicity.** Extensive research in the United States has documented a variety of evidence demonstrating educational inequality in

educational outcomes arising from students' racial and ethnic identities. In particular, Palmer (2013) demonstrated that significant racial achievement gaps exist, as black students have fallen behind their white peers on all measures in the 2011 National Assessment of Educational Progress (NAEP) data. In addition, Reardon et al. (2013) reported that there are achievement gaps between white and black and white and Hispanic students, indicating that these gaps remain quite large across all 50 states based on data from NAEP and state accountability tests. In particular, the achievement gap in reading between white and black students for the 2002 cohort in fourth grade was 0.78 standard deviations (SD), while that between white and Hispanic students was 0.64 SD. However, these studies and government reports often do not differentiate gender and SES when presenting information on educational inequality, thereby overlooking dynamics and complexities coming from the simultaneity of multiple identities.

***Structural barriers.*** Scholars have also examined structural barriers in students' schooling experiences affecting racial inequality in educational outcomes. The problems of structural barriers in relation to race or ethnicity include teacher quality and access to a quality curriculum. Scholars focusing on the structural barriers that racial minority students are experiencing often argue that there are "accumulated differences in [gaining] access to key educational resources" (Darling-Hammond, 2010, p. 28) based on students' racial identities; they have designated these differences as "opportunity gap" or gaps in "opportunity to learn (OTL)" (Schmidt & McKnight, 2012, p. 13). Scholars focusing on the opportunity gap and OTL contend that inequalities in educational input resources are exacerbated over generations with historical, economic, and sociopolitical factors and create "educational debt" (Ladson-Billings, 2006, p. 5). In addition, educational researchers

often express their anger about institutionalized inequality in school organizations (e.g., Delpit, 2012). For example, Goldhaber et al. (2015) found that three measures of teacher quality (i.e., experience, licensure exam scores, and scores from value-added models) were inequitably distributed across three indicators of student disadvantage (i.e., free or reduced lunch status, underrepresented racial minority, and low prior academic performance) in Washington State. The authors raised the issue of unequal teacher quality for disadvantaged students and suggested that policymakers will need to "define their ideal distribution of teacher quality" (p. 305).

Furthermore, scholars have explored the association between different course taking and curriculum and racial inequality in educational outcomes. For example, Alexander (2002), relying on classroom and school-level data, also found that higher percentages of minority and poor students in school were associated with lower shares of student class time devoted to advanced courses. This evidence is particularly troubling because such tracking is related to curriculum differences that often lead to performance disparities (Darling-Hammond, 2010). In particular, Darling-Hammond indicated that students placed in lower tracks tend to have limited instruction, such as work at a low cognitive level compared to those in higher tracks working on higher-order thinking and independent learning. Furthermore, the different curriculum opportunities become a significant factor in causing gaps because "teacher interaction with students in lower-track classes is less motivating and less supportive, [and] more likely to focus on behavioral criticisms, especially for minority students" (p. 55). However, as scholars have demonstrated (Coley, 2001; Entwisle, Alexander, & Olson, 1994; Hedges & Nowell, 1995), gender is also a critical factor influencing achievement gaps in math.

***Culture***. When examining racial inequalities in educational outcomes,

sociologists and ethnographers have typically been grounded in the concept of culture. Culture is conceptualized among scholars as the "learned norms, values, beliefs, behaviors, and ways of knowing—more in line with a mental abstract or code—that people use in response to their social environments" (Howard, 2010, p. 52). Recent literature using the concept of culture explain the racial inequalities in educational outcomes based on cultural difference, disconnect, or discontinuity models, which contend that culturally diverse students bring cultural and social capital to the classroom (e.g., Lee, 2002). This group of scholars argues that the widening performance gap is due to the cultural discontinuity between racial minority students and schools, parental involvement, and neighborhoods. For example, Delpit (2006) argued that the cultural clash between students' culture and school culture can lead educators to misread students' abilities and aptitudes. More specifically, the discordance in cultural codes can negatively affect student performance. This negative effect results from teachers' use of instructional styles that differ from students' community norms. That is, the origin of school knowledge in the United States is largely based on a Eurocentric worldview and ideology and often neglects the experiences, histories, and cultures of students of color (Howard, 2010).

However, many studies focusing on cultural characteristics related to race/ethnic identity also synchronously omit the influence of culture associated with SES. The lack of consideration of the cultural characteristics associated with any given social class in education research might create a limitation for fully uncovering the wholeness in people's lives. Indeed, some scholars have provided evidence that white cultural characteristics can be differentiated when considering cultural characteristics associated with social class. For example, Irvine and Armento (2001)

highlighted that middle-class white students have historically outperformed working-class white students because school curriculum, instruction, and assessment are responsive mainly to middle-class white students. Thus, the premise of simultaneity is essential when exploring schooling experiences and educational outcomes of students with multiple identities.

**Studies focusing on only gender.** The gender effect on student performance varies across subjects and school levels (elementary or secondary school level) in the United States. Most studies demonstrate that female students outperform male students in reading achievement. Robinson and Lubienski (2011) showed that females' reading achievement scores were higher than those of males, albeit by less than 0.2 standard deviations (SD), in fourth grade using 2005 and 2007 NAEP data. However, the gaps in reading achievement scores between males and females grew to 0.3 SD by eighth and twelfth grades. Entwisle, Alexander, and Olson (2007) argued that boys consistently show lower achievement scores as well as lower basic reading skills (e.g., letter recognition and sound-to-letter correspondences) from kindergarten to elementary school. The authors further highlighted the importance of this gender gap, considering its serious long-term impact on boys' future experience, such as higher dropout rates and future lifetime earnings. As Entwisle et al. emphasized, gender is an important identity that differentiates not only student performance, but also students' experiences in schools. Lietz (2006) confirmed that at the secondary school level, a gender gap exists in favor of girls (0.19 SD above their male peers) based on a meta-analysis of 139 large-scale studies between 1970 and 2002.

The pattern in gendered performance of math is different from that of gendered performance of reading. In particular, Freeman (2004) reported that no

statistically significant difference occurred between boys and girls at the end of first grade using data from the Early Childhood Longitudinal Study (ECLS); however, by third grade, boys scored three points higher in reading than girls. Dee (2007) found no evidence of a gender gap in math or science at the primary school level (for 9-year olds), but studies using national data from the secondary school level found that males outperformed females in math after controlling for family background (Coley, 2001; Entwisle, Alexander, & Olson, 1994; Hedges & Nowell, 1995). These studies imply that gender is an important factor affecting students' performance in math and science subjects, especially for upper grade students. Nevertheless, the underlying assumption of these studies on the monolithic influence of gender overlooks the possibility that such patterns of gender inequality might differ when also considering specific characteristics of SES and/or race or ethnicity.

Scholars have argued that several potential factors influence students' unequal attainment and school experiences based on gender differences, including structural reasons in school and teachers' biases about gender. Structural reasons for gender inequality in schooling experiences and educational outcomes include school curriculum and tracking. For example, Bedard and Cho (2010) have shown that curriculum differentiation and tracking can also cause gender disparities. In particular, as an international study using 1995, 1999, and 2003 Trends in International Mathematics and Science Study (TIMSS) data of 26 OECD countries for eighth graders, Bedard and Cho found that the countries with more highly differentiated curriculums showed larger gender gaps in math and science than those with less highly differentiated curriculums. In addition, the authors found that the assignment rules sorting children into ability-based streams using teacher evaluations is gender-biased in favor of males, which might contribute to the gender gap. The

authors specifically asserted that females' lower average achievement in math and science is associated with the lack of females in high-level classes. In addition, Lubienski, Robinson, Crane, and Ganley (2013) emphasized that differences in instructional practices and teachers' biases are significantly associated with gender gaps in schooling experiences. Thus, previous research suggests that teachers' unintended biases associated with race or ethnicity are also critical for students' experiences and educational outcomes (e.g., Cahnmann & Remillard, 2002). Nevertheless, Lubienski et al.'s study is still limited in concurrently explaining the influence of teachers' biases regarding the intersection of gender and race or ethnicity on students' schooling experiences.

**Studies focusing on only SES.** Scholars have emphasized that "the pernicious predictability of poverty's association with student achievement is a blight on the U.S. education system" (Alexander & Jang, under review[a], p. 1). In particular, since the publication of the *Coleman Report*, scholars have paid greater attention to the effect of a student's family background on the individual's educational experiences and outcomes. For example, by linking school experience in primary school to educational outcomes in young adulthood (age 22), Entwisle, Alexander, and Olson (2005) concluded that social stratification strongly affects first graders' academic attainment level as well as years of schooling and the highest level of school attempted in early adulthood. In addition, Chiu (2010) found that students from higher SES families scored higher in mathematics tests in 41 countries than students from lower SES families. Cookson Jr. (2013) investigated students' specific consciousness according to different SES community backgrounds. Using a methodology of school portraiture to understand students' inner lives, he contended that the collective memories of students from the working class are "social blinders

that shut out social peripheral vision and condemn many young adults to a life of labor without much hope of upward mobility" (p. 93).

Sociologists have emphasized students' cultural and social capital from their family as critical factors affecting educational attainment and students' school experiences. Using Bourdieu's concept of cultural capital, Lareau (1987) concluded that family SES determines parental involvement and produces social and cultural resources that might affect students' school experiences. Using interviews with parents, teachers, and principals, Lareau compared a white working-class community and a white professional middle class community to control for the effects of race or ethnicity. She found that the interactions between teachers and parents in a working-class community were "stiff and awkward" (p. 78) whereas in the middle class community they more frequently interacted with each other, focused more on academic matters, and were much less formal. As Lareau's study demonstrated, the concept of social capital typically relates to class focusing on the white population and is still not generalizable to other people of color; for example, we still do not know if the theory of cultural and social capital can apply to Southeast Asian people.

As discussed, the studies focusing only on race or ethnicity or gender or SES in educational research are limited in fully uncovering the lives and experiences of students of color with different social locations and identities. In this regard, the premise of simultaneity in intersectionality is relevant for understanding the nuanced and complex experiences of students with multiple identities. Based on the premise of simultaneity, scholars often include all available student identities (e.g., gender, ethnicity, English language learner status, SES), which might influence their analyses (e.g., Chan, Kato, Davenport, & Guven, 2003).

**Multiplicity**

Although simultaneity emphasizes merely the need to include the identities of race or ethnicity, gender, and SES in analyses at the same time, the premise of multiplicity specifically illustrates the essence of the relationships among race or ethnicity, gender, and SES. In order to specify the characteristics of the multiplicative relationship among race or ethnicity, gender, and SES, a comparison with the additive relationship becomes helpful. Earlier scholarship researching multiple identities at the end of the 19th century (e.g., Anna Julia Cooper) argued that the dual discriminations of racism and sexism subordinate black women's lives in an additive way. In particular, Frances Beale, a founding member of the Women's Liberation Committee of the Student Nonviolent Coordinating Committee (SNCC), utilized the term *double jeopardy* to describe the dual oppressions of racism and sexism that black women experience (King, 2007). Based on the additive approach, some scholars added more oppressions (e.g., capitalism, heterosexism), thereby creating triple, quadruple, and multiple jeopardies. The additive approach assumes that the relationships among multiple discriminations and oppressions are simply additive. For example, racism plus sexism results in double jeopardy. Landry (2007) provided an example of the additive approach:

> Female slaves had the cumulative experience of floggings, mutilations, plus rape. It seems to make intuitive sense that somehow these various experiences of [black] female slaves added up or were cumulative to the point that they exceeded even what black male slaves experienced. (p. 13)

More recently, scholars have criticized the overly simplistic additive approach in explaining the lives of people with multiple marginalized identities (e.g., Brewer, 2003; Collins, 1998; King, 1988; Zinn & Dill, 1996). These scholars have

instead emphasized the multiplicative way in the relationships among multiple discriminations and oppressions by race or ethnicity, gender, and SES. In particular, King (1988) used the term *multiple* to refer not only to simultaneous influences of race or ethnicity, gender, and SES, but also to the multiplicative relationships among them as racism multiplied by sexism multiplied by classism. Thus, the multiplicative relationship among race or ethnicity, gender, and SES indicates that influences of race or ethnicity, gender, and SES are more complicated than the sum of the parts.

The difference between the multiplicative relationship and the additive relationship corresponds to the difference in statistical terms between interaction and linear terms. By employing a statistical interaction term, the examination of the multiplicative relationship is easier to capture in a systematic way in quantitative studies than in qualitative ones. That is, the interaction terms allow researchers to describe a context in which multiple identities converge and when the association between experience and one identity is dependent upon other identities. For example, Autor, Figglio, Karbownik, Roth, and Wasserman (2015) showed the intertwined nature of students' gender and SES. In particular, Autor et al. examined the multiplicative relationship of SES and gender and their impact on students' experiences by employing the interaction term between SES and gender. Based on the significant statistical interaction term of boy × SES, they interpreted that the effect of SES on dependent variables varies across categories of gender or the effect of SES on dependent variables is conditional on gender. Ultimately, Autor et al. found that lower SES more negatively influenced kindergarten readiness and behavioral and educational gaps in elementary and middle school performance for boys than for girls. Through the detection of statistical interactions, quantitative studies have provided strong evidence of the multiplicative relationship among

diverse identities, which is one of the core premises of intersectionality (e.g., Autor et al., 2015; May & Dunaway, 2000; Nomaguchi, 2005).

**Power Relations**

The third premise of intersectionality assumes that the multiplicity of intersectionality arises from interlocking, mutually constructing or intersecting systems of power in relation to race or ethnicity, gender, and class. Thus, the premise of power relations contends that social or educational inequality is closely related to the mutual construction of racism, sexism, classism, and colonialism. There are elements of power on which intersectionality scholars focus: institutionalized racism, institutionalized sexism, institutionalized classism, and colonialism. An understanding of how power works in each domain can provide insights on the dynamics of power relations. The following sections address each element of power relations. Scholars focusing on power relations can also provide an understanding of how power, privilege, and oppression differentiate Southeast Asian female students' schooling experiences and educational outcomes from those of other student groups.

**Institutionalized racism**. Critical theorists have used the concepts of power, privilege and oppression, and institutional racism to explain the racial inequalities in students' schooling experiences and educational outcomes. In this strand of scholars, critical race theory (CRT) scholars have argued that students' experiences in schools "cannot be separated from white privilege, which is held to undergird almost all of American society" (Palmer, 2013, p. 52). CRT enables us to "understand how a regime of white supremacy and its subordination of people of color have been created and maintained in America" (Khalifa, Dunbar, & Douglasb, 2013, p. 491). Capper (2015) further explored the implications of CRT to inform educational leadership in order to eliminate racism in schools. Using a literature analysis of CRT

in educational leadership, Capper defined six CRT tenets: permanence of racism, whiteness as property, counternarratives and acknowledgment of majoritarian narratives, interest convergence, critique of liberalism, and intersectionality. As this study suggests, current CRT researchers endeavor to draw practical implications for educational leadership and social justice. They also try to go beyond race or ethnicity to include other identities. Thus, scholars using the concept of power and oppression (e.g., Derrick Bell, Kimberlé Crenshaw) have provided useful inferences for and knowledge of intersectionality, as will be discussed later. In addition, scholars in this body of research provide an important perspective by attempting to "link theory with practice, scholarship with teaching, and the academy with the community" (Parker & Villalpando, 2007, p. 520), as a social justice project.

CRT scholars have emphasized that subordination and institutionalized racism are intrinsic and vital to most American institutions (Duncan, 2002; Ladson-Billings, 1999). CRT offers critical ways of thinking related to race and racism: 1) they argue race is a central component of social organizations; 2) racism is institutionalized; and 3) members of racialized social systems may reproduce these systems through social practices (Bonilla-Silva, 2013). CRT scholars argue that institutionalized racism makes students of color confront more social and educational risks, which can be closely related with racial inequalities in schooling experiences and outcomes. For example, Noguera (2009) has argued that black students face more risks, such as lack of access to health, welfare, and education services, than white students face. This critical perspective in CRT using the concepts of power and oppression challenges ideas deeply rooted and "enmeshed in the fabric of [American] social order" (Ladson-Billings, 1999, p. 212) and provides important knowledge for eliminating the oppression of students of color as well as transforming

unjust educational systems in the United States. Nevertheless, CRT mainly focuses on the issues of black, Hispanic, and Native Americans and often does not include the issues of educational inequalities experienced by Asian students. This limited perspective of not including Asian students in CRT might be partly based on the model minority stereotype, considering Asian populations as characterized by "self-reliance, valorization of family, reverence for education, and political moderation" (Wu, 2014, p. 242) based on the economic success stories of Japanese and Chinese Americans in American history. This model minority stereotype often creates new forms of exclusion by ignoring nuances of experiences of sub-populations among Asian Americans, such as Southeast Asians, a focus of this study.

**Institutionalized sexism**. Scholars have argued that gender is "an institutionalized system of social practices" (Ridgeway & Correll, 2004, p. 510) based on cultural beliefs about gender (gender beliefs) at the macro level. In particular, gender beliefs specifically describe women as more communal and requiring more subordinate behaviors whereas men are considered to be more agentic and required to perform more dominant behaviors for successful role performance (Eagly, Wood, & Diekman, 2000). This belief about gender is hegemonic in that specific descriptions of women are institutionalized in the social media and policy in American society (Ridgeway & Correll, 2004). In addition, scholars have demonstrated that institutionalized gender beliefs undermine female students' performance and interest, particularly in STEM subjects (e.g., Gunderson, Ramirez, Levine, & Beilock, 2012; Shapiro & Williams, 2012). Furthermore, feminist scholars often explain female students' schooling experiences and educational attainments by using the concept of systems of gender oppression and

power domination (sexism) underlying the institutionalized gender belief (e.g., Dill & Zambrana, 2009; Núñez, 2014; Sadker & Zittleman, 2001).

**Institutionalized classism**. Studies have also highlighted structural barriers in American schools that students from lower family SES are facing as a factor influencing educational inequality. These structural barriers related to SES include school overcrowding (Rogers, Freelon, & Bertrand, 2012), lower teacher expectations (Jussim & Harber, 2005), insufficient school resources (Darling-Hammond, 2010; Lacour & Tissington, 2011), and limited access to advanced courses (Alexander, 2002). For example, Darling-Hammond (2010) found that upper-income parents more often lobby for better academic programs, school facilities (e.g., computers, libraries), and more qualified teachers than their less wealthy counterparts. Thus, Darling-Hammond (2010) addressed the issue that "the wealthiest school districts in the United States spend nearly 10 times more than the poorest, and spending ratios of 3 to 1 are common within states" (p. 12) as a critical component of educational inequality. In a similar vein, Alexander (2002), relying on classroom and school-level data, found that the higher percentages of minority and poor students in big city school districts in New York state were associated with lower shares of student class time devoted to advanced courses. Critical theorists often use the term *classism* to describe such structural oppressions based on class, similar to other forms of oppression (e.g., racism and sexism). Scholars have denoted classism as "prejudice based on negative attitudes toward and classist stereotypes of working class people, and discrimination based on overt behaviors that distance, avoid, and/or exclude on the basis of class distinctions" (Bullock, 1995, p. 119).
As these studies demonstrate, scholars focusing on the influence of students' SES on their schooling experiences and educational outcomes argued "poverty still stands as

the most insidious enemy of education" (Capra, 2009, p. 79) because the detrimental impact of poverty is often compounded by structural barriers in schools. For example, poor students often attend schools with other poor students as well as schools with insufficient resources to support them (Lacour & Tissington, 2011).

**Colonialism.** The post-colonial theories' disruption of modernist theoretical traditions in the totalized understanding of lives of people with multiple identities fits well with the theoretical foundations of intersectionality. External power forces from historical colonialism have specific influences on Southeast Asian female students' educational experiences in the United States (Khalifa, Douglas, & Chambers, 2016). In particular, Crenshaw (2001) highlighted the importance of oppression stemming from colonialism in creating multiple layered oppressions in the lives of indigenous/native people. In line with the theoretical foundations of postcolonial theorists, indigenous scholars have also challenged the legitimacy of a colonialized and white settler society. Fitzgerald (2006) condemned colonized school organizations that "serve to homogenize and standardize and simultaneously segregate, stratify and marginalize" (p. 203). They argue that the white colonial mindset embedded in American schools facilitates "the continuation and creation of oppressive systems, hegemonic hierarchies, privileged indifferences, and the acceptance of inferiority as norm by the subaltern" (Khalifa et al., 2016, p. 6).

The third premise of intersectionality, power relations, suggests that racism, sexism, classism, and colonialism become systems of oppression for those with marginalized identities but systems of privilege for those with fewer marginalized identities. In relation to the second premise of intersectionality, multiplicity, the concept of power relations further represents that each power/oppression arising from diverse identities works together in a multiplicative way, thereby influencing

people's lives. Thus, this premise is particularly important for understanding mutually reinforcing power relations that Southeast Asian females may experience based on their unique positionality from multiple identities.

**Social Context**

The final premise of intersectionality, social context, indicates that inequality emanating from the intersectionality of race or ethnicity, gender, and SES varies across different social contexts. These social contexts include organizations and institutions (e.g., schools, districts) as well as specific geographic places and time (e.g., Anthias, 2013). In particular, organizational theory demonstrates diverse contexts of schools and districts affecting students' schooling experiences and learning as "institutional actors in the public sector" (Louis, 2016, p. 1). The literature indicates that schools' location is closely associated with different learning needs of students in schools (e.g., Rist, 2002), which might differentiate patterns of students' schooling experiences and educational outcomes. In addition, schools and districts that serve students in need (e.g., English language learners, lower SES students, students with disabilities, students of color) are at a greater disadvantage than those without diverse students due to more barriers in instruction (e.g., Mintrop & Sunderman, 2009).

School size is an additional factor that the literature suggests may be associated with students' schooling experiences and educational outcomes. For example, educational leadership literature suggests that school size and urbanicity are associated with a principal's instructional leadership (Louis, 2016), which might also be associated with students' learning in schools. Although organizational theory suggests that organizational contexts are significantly associated with students' experiences in schools, the role of social context in the construction of multiple

identities is still underexplored (Hurtado, Alvarez, Guillermo-Wann, Cuellar, & Arellano, 2012).

## Intersectionality Research in Education

Intersectionality research in education strives to dismantle systems of oppression and power in schools and highlights "the restricted options and opportunities of historically underrepresented groups in the United States" (as cited in Zambrana & Dill, 2009, p. 277). In addition, intersectionality researchers in education ask questions of "how interactions between social inequalities such as race or ethnicity, class, gender, sexuality, and ability shape educational experiences and outcomes of disenfranchised populations" (Collins & Bilge, 2016, p. 39). The scholarship of intersectionality in education tackles teacher training, curriculum design, pedagogical tools for educational leaders, and policy intervention. Compared to scholars who conducted intersectionality studies in non-education contexts (e.g., public health, business organization with a workforce), intersectionality researchers in education have found that students' marginalized identities (e.g., race or ethnicity) intersects with other historically underprivileged identities in shaping students' educational experiences and outcomes. These studies often utilize a qualitative approach that has limited generalizability. Furthermore, the transformative policy interventions to address educational inequality that intersectionality researchers suggest are often hard to implement. This is because the more a policy option attempts to change the existing condition (i.e., changing power relations in schools), the harder it is to implement because this option requires more time and additional resources (Alexander, 2012).

**Qualitative Intersectionality Research in Education**

Studies focusing on intersectionality often employ a qualitative approach due to its strengths in fully describing the lived experiences of marginalized people based on unique historical, cultural, and organizational contexts. In addition, qualitative studies "appear to be more compatible with the theoretical language and intent of intersectionality" (Shields, 2008, p. 306). Qualitative studies can illustrate the reality of students' experiences in their school lives at the micro level and give a close-up understanding of the experiences based on diverse students' identities. In addition, intersectionality studies can provide in-depth information about the effects of the different social locations and relations among societal structures and processes as well as social inequalities that multiple marginalized identities create (e.g., Gershon, 2013; Griffin & Reddick, 2011; Maramba & Museus, 2011; Ramírez, 2013). In particular, qualitative researchers can thoroughly explore the meaning of students' multiple and less visible identities (e.g., sexual orientation) by actually talking with students about their identities through diverse qualitative research methods (e.g., interview, observation), compared to quantitative intersectionality studies. For example, Kozol (2012) described the lives of poor female and racial minority youths based on ethnographic research. He provided a rich detailed illustration of struggles in the lives of people with multiple marginalized identities (e.g., female, poor, black or Hispanic) through striking narratives. In particular, Kozol contended, "how human beings devalue other people's lives, how numbness and destructiveness are universalized, and how human pity is at length extinguished and the shunning of the vulnerable can come in time to be perceived as natural behavior" (p. 186). As such, qualitative intersectionality studies are well suited to reveal the processes of

amplification in privileging or oppressing specific populations based on different identities.

Scholars have also addressed several challenges of qualitative intersectionality studies. The most critical challenges of a qualitative intersectionality study lie in its subjectivity and limited generalizability of findings because of its use of more purposive samples. A qualitative approach can be limited in its ability to provide knowledge on national and generalizable general patterns in the association between intersecting identities and students' experiences in schools. Furthermore, qualitative intersectionality studies in education typically include only two intersecting identities and omit one or more relevant identities (mainly SES) or represent too few cases. In addition, qualitative intersectionality studies still lack a clear language and strategy for analyzing qualitative data (Landry, 2007).

**Quantitative Intersectionality Research in Education**

Compared to qualitative intersectionality research, a critical purpose of quantitative intersectionality research lies in its contribution to producing generalizable knowledge and reliable hypothesis testing of the underlying assumptions of intersectionality. In particular, quantitative studies exploring intersectionality in education typically examine the core assumptions of multiplicity and simultaneity in the intersectionality of race or ethnicity, gender, and SES through the detection of statistical interactions (Landry, 2007). Based on this approach, scholars using large administrative datasets have found evidence of the multiplicative effects of diverse identities, although some scholars specifically did not use the term of intersectionality.

Quantitative intersectionality research has suggested a great deal of knowledge about multiplicative influences of race or ethnicity and gender on

students' schooling experiences and educational outcomes. Focusing on the intersection of race or ethnicity and gender, Zinn and Dill (1996) advocated for multiracial feminism, recognizing the "centrality of race, of institutionalized racism, and of struggles against racial oppression that link the various feminist perspectives" (p. 321). To illustrate the multiracial perspective, Harnois (2013) analyzed 2002 and 2006 General Social Survey (GSS) data—a source commonly used in sociological research. Although her study focused on workplace experiences, she found that Latina groups are more likely than non-Hispanic whites to experience gender discrimination. In addition, focusing on high school math courses, Riegle-Crumb (2006) found that race or ethnicity does not affect math course taking (Algebra I) in identical ways for male and female students. Specifically, while African-American and Latino students are likely to reach lower levels of the math course sequence than their white peers, female minority students did not show the same lower rates. By separately analyzing the math course-taking patterns of males and females using national data from Adolescent Health and Academic Achievement (AHAA), rather than identifying a female disadvantage in a math course, the study found that African-American males as a group are the most held back in high school Algebra I.

Scholars have also included students' SES in their intersectionality frameworks to examine how SES interacts with race or ethnicity and gender to affect students' schooling experiences and educational outcomes. For example, Oakes (1990) examined the intersection of students' race or ethnicity and SES in national educational opportunities to learn mathematics and science. Oakes concluded that "assessments of academic ability, placement in different ability-grouped classes, and the reduced educational opportunities that characterize low-track classes often parallel race or ethnicity and social class difference" (p. 8). Specifically, African

American and Hispanic students from lower SES were enrolled in secondary schools with less extensive and less demanding curriculum and had less access to school resources (e.g., computers, science laboratories, and coordinator staff) than their peers. Oakes' study demonstrated the "cumulative effects of discrimination" (p. 9) of race or ethnicity and social class on opportunities at the elementary level. In contrast, focusing on high SES students across race or ethnicity groups, O'Connor (2009) found that the disadvantages of Hispanic students intensified with higher SES in 4-year college enrollment. In particular, she found that Hispanic students from a higher SES background are likely to have less enrollment information for 4-year colleges than their white counterparts from a higher SES background.

Even with the relative advantages of quantitative approaches (e.g., generalizable knowledge about intersectionality), scholarly explorations in the quantitative studies using a large data set are still limited. For example, studies exploring intersectionality, especially gender and SES, are often limited in their analysis as they use only simple comparisons, focusing on a singular identity rather than different combinations of multiple identities. That is, even when scholars include multiple identities in their analyses, they often control for one identity while ignoring the nuanced and multiplicative nature of multiple identities. In addition, although the concept of power in intersectionality is important (the third premise of intersectionality), quantifying power arising from multiple identities in quantitative studies is challenging. Finally, most studies examined only a part of intersectionality in students' standardized test achievement scores and have not accounted for diverse students' schooling experiences (e.g., quality of interactions with teachers, students' self-stereotypes) and outcomes, including non-cognitive skills (e.g., students' eagerness to pursue higher education).

## Student Experience, Educational Outcomes, and Organizational Characteristics

Researchers have explored diverse determinants for students' educational outcomes in schools as well as their intention to pursue postsecondary education and their choice of career paths (e.g., Schmidt & McKnight, 2012). In particular, scholars have demonstrated that students' different experiences in schools are important factors determining their achievements and future education and career paths (e.g., Darling-Hammond, 2010). Furthermore, organizational theory has examined how different school organizational characteristics are related not only to students' outcomes, but also to their schooling experiences. Nevertheless, this body of literature often does not consider the multiplicative influences of diverse marginalized identities on student experience and educational outcomes in relation to school organizational characteristics. The following sections summarize the review of the literature exploring interrelationships among students' schooling experiences, educational outcomes, and organizational characteristics.

### Student Experience and Educational Outcomes

The literature on education psychology and the education production function approach to analyzing educational outcomes suggest that students' experiences in schools are important determinants for educational outcomes. These experiences broadly represent students' psychological properties (i.e., self-stereotype) and exposure to an event both in school (i.e., exposure to high-quality teachers and quality of interactions with teachers). The remainder of this section reviews literature exploring the relationship between diverse students' schooling experiences and educational outcomes. In addition, it offers an overall critique of the literature.

**Stereotype threat.** Scholars have explored psychological characteristics influencing students' educational outcomes. Among these psychological characteristics, literature suggests that "stereotype threat" (Steele, Spencer, & Aronson, 2003) influences students' educational outcomes in a negative way. Stereotype threat indicates "when a student perceives that (s)he could be viewed through the lens of a negative stereotype and lowers academic engagement and performance as a result" (Egalite, Kisida, & Winters, 2015, p. 45). Depending upon the subject of having a negative stereotype, scholars have shown that students' self-stereotype and teachers' stereotype affect educational outcomes differently. In particular, students' self-stereotype threat indicates a condition in which a student's negative perception about his or her ability in academic activities limits the actual ability for academic performance. For example, focusing on students' self-stereotype related to race or ethnicity, Steele and Aronson (1995) found that asking about race or ethnicity categorization at the beginning of a test, instead of at the end of the test, is negatively associated with achievement scores of black students. Steele, Spencer, and Aronson (2003) argued that teachers also likely cause a "stereotype threat" for students of color by holding low expectations and stereotypes about minority students' expected performance. Thus, scholars focusing on teachers' stereotype toward students' ability based on students' race or ethnicity or gender categories often emphasize that reducing teachers' unintended biases and different expectations can improve student performance (e.g., Cahnmann & Remillard, 2002).

Steele and Aronson (1995) concluded that reducing stereotypes among black students can contribute to reducing racial outcomes of inequality. However, researchers and practitioners should be cautious regarding their conclusions for two reasons. First, diverse complex social factors affect the educational inequality that

students of color are facing. We still do not know if removing individual stereotypes of black students alone might alleviate chronic educational inequality without considering complexities involved in racial achievement gaps. Second, as Steele and Aronson (1995) included only black female students in their experiment to theorize stereotype threat, the findings still circumscribe the generalizability of stereotype threat to all racial minority students or both men and women. Thus, although students' and teachers' stereotypes can serve as deleterious determinants for students' educational outcomes, getting rid of them should not be interpreted as a cure-all for educational inequality by practitioners. Further research needs to examine if such stereotypes equivalently apply to other racial minority students (e.g., Southeast Asian students) and different subpopulations of black students based on different gender.

**Exposure to high-quality teachers.** Scholars have frequently argued that teachers are the most important school-related factor for educational outcomes (Clotfelter, Ladd, & Vigdor, 2010; Goldhaber, 2002; Hanushek, 2007; Harris & Sass, 2011). For example, Duncan and Murnane (2014) argued that high-poverty schools need to be able to "attract and retain well-educated, effective teachers" (p. 144) to restore educational opportunities. More specifically, Hargreaves and Fullan (2012) emphasized teachers' professional capital, which can lead to differences in the learning and achievement of all students. Among teacher-related factors, scholars have focused great attention on measuring teacher quality based on a teacher's graduate degree and teaching experiences.

Scholars have demonstrated that teaching experiences and graduate degree of teachers (master's degree or above) are associated with students' educational outcomes. In terms of teaching experience, scholars often found that a teacher with

some experience is more effective than novice teachers in promoting student achievement, particularly in mathematics (Clotfelter, Ladd, & Vigdor, 2010; Wayne & Youngs, 2003). In addition, although past research has indicated that the effects of having a graduate degree on student achievement vary partly by academic subject, research on mathematics and science subjects in high school has typically shown positive associations between having a graduate degree and student achievement. For example, Goldhaber and Brewer (2000) found that teachers with master's degrees are positively associated with students' higher math achievement scores compared to teachers without a master's degree, using data from the National Educational Longitudinal Study of 1988. Goldhaber and Brewer employed a multiple regression analysis using a value-added approach (i.e., including previous 10$^{th}$ graders' achievement in their model). Focusing on science achievement, Henry et al. (2014) examined the relationship between student achievement and teachers with a master's degree, showing a significant positive association. Although this strand of studies identifies the measure of teachers' credentials, it typically uses only student test scores as a measure of educational outcomes, rather than using students' long-term outcomes, such as students' intention to enter higher education, as a measure of educational outcomes. Furthermore, this strand of studies does not fully explore the relationship between the systematic sorting of teacher quality (as measured by having a master's degree and more teaching experience) and students' intersecting multiple identities. This body of research typically does not reveal the issue of inequality in students' interactions with teachers according to students' multiple identities.

**Quality of interactions with teachers.** Research in school psychology has demonstrated that the quality of teachers' interactions with students can influence

student learning. The characteristics of high quality interactions between students and teachers include teachers' expectations of students (e.g., Weinstein, 2002), high respect for students (e.g., Hattie, 2003), and fair treatment toward students (e.g., Danielsen, Wiium, Wilhelmsen, & Wold, 2010). In particular, a teacher's higher expectations of students in the classroom can positively influence students' performance and achievement (Weinstein, 2002). Teacher's expectations can be "exemplified in the learning opportunities provided, in the affective climate created and in the interactional content and context of the classroom" (Rubie-Davies, Hattie, & Hamilton, 2006, p. 430). A teacher's higher respect for students as learners enables him or her to recognize students' barriers in learning by demonstrating care and commitment (Hattie, 2003). Finally, a teacher's fairness as part of students' perceived teacher support is significantly associated with students' academic initiatives (Danielsen et al., 2010), which can positively affect students' educational outcomes. Studies focusing on specific psychological aspects in interactions between teachers and students illustrates that the quality of interactions in students' schooling experiences matter for their educational outcomes. However, this research perspective typically does not reveal the issue of inequality in students' interaction with teachers grounded in the students' multiple identities. Overlooking the implications of the multiple identities of students is a critical omission because the quality of teacher-student interactions is important for student achievement.

**School Organizational Characteristics**

Identifying the organizational factors influencing students' schooling experiences and educational outcomes has been a critical interest for educational leaders and researchers. Identifying organizational characteristics that may be associated with marginalized students' schooling experiences and educational

outcomes is particularly influential for eliminating educational inequities based on students' diverse marginalized identities. In addition, critical theories exploring power structures in schools often emphasize the role of school organizations in perpetuating or undermining educational inequities in American schools. Indeed, Hurtado et al. (2012) argued that "scholarship is still needed to also identify how institutions produce inequality [because it] has the potential to advance institutional transformation if it moves institutional actors towards reflexivity to alter their role in the reproduction of inequality" (p. 105). The following sections review the literature exploring focal and contextual organizational characteristics that may be related to students' experiences and outcomes in schools: school climate and school contexts (i.e., school's demographic composition and community type).

**School climate**. Scholars have highlighted the importance of school climate in affecting students' schooling experiences and educational outcomes. Furthermore, the 2015 reauthorization of the Every Student Succeed Act (ESSA) included school climate in its measurement requirements. School climate is broadly defined in this study as indicating "the prevailing influence or environmental conditions characterizing a group [in a school]" (as cited in Chermack et al., 2015, p. 356). Scholars have used various characteristics to measure school climate. In particular, Louis and Lee (2016) conceptualized school climate by using academic press, academic support for students, trust and respect, and professional community in teachers' capacity for organizational learning. In addition, Darling-Hammond (2010) suggested the need to consider (1) meaningful learning goals; (2) an intelligent, reciprocal accountability system; (3) equitable and adequate resources; (4) strong professional standards; and (5) the organization of schools for student and teacher learning. Although great variation exists in climate measurement, scholars typically

agree that positive school climate has a positive influence on students' academic performance (e.g., Cheema & Kitsantas, 2014; Johnson & Stevens, 2006; McCoy, Roy, & Sirkman, 2013). More importantly, scholars provide evidence that a positive school climate weakens the detrimental influence of poverty and other factors related to marginalized identities on students' schooling experiences and academic performance (Berkowitz, Moore, Astor, & Benbenishty, 2017).

Nevertheless, most studies focusing on school climate use only one measure, mainly from a student climate questionnaire. The limited use of measures for school climate is particularly troubling because measuring school climate should include multiple perspectives given that school organizations include diverse individuals such as administrators, parents, and students (Berkowitz et al., 2017). For example, scholars argue that parents' active participation is an essential characteristic of positive school climate, (e.g., Catalano, Haggerty, Oesterle, Fleming, & Hawkins, 2004; Ladd & Dinella, 2009) and that it is critically associated with students' success in schools (Barnard, 2004).

**School context.** As previously noted, scholars have emphasized the importance of schooling contexts on the divergence of students' schooling experiences and learning. The contexts that scholars have emphasized include schools' community type (i.e., urbanicity) and the different composition of the student body in a school. In particular, schools' community type (i.e., whether or not a school is located in an urban, suburban, or rural area) can be important in differentiating the salience of the effect of race or ethnicity due to different demographic composition in the community. Accordingly, different schools' community types might have an impact on the intersectionality related to race or ethnicity with other identities. Furthermore, school finance scholars often contend

that schools with a higher percentage of students living in poverty face greater barriers and challenges for educational equity (e.g., Alexander & Jang, under-review[b]). Hancock (2007) also argued that the racial composition of a school should be included as a prerequisite for the racial salience in the intersectionality inquiry.

In summary, scholars have underscored the influences of diverse school organizational characteristics differentiating students' experiences and educational outcomes. Based on the extensive research spectrum in this strand of literature, scholars have argued that schools matter for student experience, and they have suggested the possibility that school-related factors might mediate or exacerbate the influence of students' identities on their school experience. However, few scholars have specifically explored the association and interplay between the intersectionality of students' multiple identities and school organizational characteristics using quantitative analysis. Thus, how school organizational characteristics can mitigate the complexity of disparities in students' experiences remains unknown although it is an important question for educational leaders to explore in their effort to alleviate educational inequalities in their schools.

## Southeast Asian Students

The schooling experiences and academic achievements of Southeast Asian students, such as Vietnamese, Hmong, Cambodian, and Lao students, are often masked in academic research because the data for Southeast Asian students are frequently aggregated in the general Asian population. Ngo and Lee (2007) appropriately criticized both this tendency in research and also the exclusion of Southeast Asian students in policy discussions:

> The experiences of Southeast Asian Americans in U.S. schools and society are thus reduced to binary extremes. One consequence of such categorization is the denial of attention and support to Southeast Asian students and families based on dual, contradictory assumptions that they have no problems or are dysfunctional and do not deserve assistance. (p. 416)

In the same vein, Lowe (1996) criticized the use of only one Asian student category as a fixed culture and Asian racial/ethnicity identity to represent the heterogeneity among Asian-American students. Note that similar criticism may be applied to the study of black and Hispanic students, where there are sub-groups (e.g., African refugees, Central Americans) in each category that do not mirror the realities of others in the group. Based on these criticisms, scholars focusing on Southeast Asian students have demonstrated that schooling experiences and educational outcomes of Southeast Asian students are significantly different from those of black, Hispanic, and Asian students overall (Ngo & Lee, 2007; Ngo, 2013). As noted, the educational attainment of Southeast Asian individuals is much lower than that for Asian Americans overall and lower than that of African Americans (Ngo & Lee, 2007).

Among the three previously discussed factors used to explain racial inequities (i.e., structural barriers, culture, institutionalized racism), scholars have explained racial inequities and uniqueness in schooling experiences and educational outcomes of Southeast Asian students mainly through cultural characteristics from qualitative studies. For example, Timm, Chiang, and Finn (1998) found that Hmong students in American schools typically value kinship and cooperation over individualism. Timm, et al. argued that the cultural dissonance between Southeast Asian students' home cultural characteristics (i.e., preferring to work with others and have external guidance as well as focusing on social cues) and school culture (e.g., independent

learning) often creates disadvantages for Hmong students. Furthermore, focusing on Cambodian students, Rumbaut (1989) claimed that their practice of Theravada Buddhism, leads to "an adaptive style that is more passive and reactive, comparatively less pragmatic and more fatalistic" (p. 181).

Scholars have found that Southeast Asian students' schooling experiences and educational outcomes are also closely related to their gender identity. In particular, studies have demonstrated that patriarchal norms devaluing females as well as early marriage and childbearing patterns are salient factors affecting the distinct experiences and outcomes of Southeast Asian students. For example, Goldberg (1999) found that Cambodian girls face significantly high cultural pressure from their family members to marry and have children, which leads to higher dropout rates. In addition, researchers have demonstrated that the cultural expectation for Hmong girls is that they have to take care of their younger siblings and do other household tasks (Lee, 2001). These unique cultural expectations about gender roles might negatively affect Southeast Asian female students' schooling experiences and educational outcomes (Ngo & Lee, 2007). As these studies demonstrate, the gender identity of Southeast Asian students is inextricably linked to racial identity, thereby creating a uniqueness in their experiences and educational outcomes.

Qualitative studies have also identified structural barriers and racism experienced by individual students in schools as critical factors influencing Southeast Asian students' schooling experiences and educational outcomes. Studies focusing on the structural barriers in schools experienced by Southeast Asian students have addressed the issues of teachers' lack of knowledge about students, tracking into lower level courses, and teachers' low expectations (DeVoe, 1996; Ngo & Lee,

2007). Furthermore, Kiang and Kaplan (1994) reported that all the Vietnamese students they interviewed indicated that they have experienced harassment and discrimination based on race or ethnicity. One example of inequity resulting from such discrimination was that Vietnamese students were limited in using school spaces, such as classrooms, hallways, and cafeteria. These qualitative studies show that Southeast Asian students experience structural barriers and interpersonal racism. Studies using quantitative data in the United States need to explore and provide rigorous and objective evidence of the structural barriers Southeast Asian students' face in schools, which will facilitate policy design and adequate support for these students. In addition, the need exists for more research focusing on how institutional racism (mainly addressed in CRT) affects Southeast Asian students' schooling experiences and educational outcomes.

## Research Gaps

Although the intersectionality of multiple marginalized identities, primarily as an analytical framework or tool, has been utilized in education research, insufficient attention has been focused on the intersectionality of students' race or ethnicity, gender, and SES affecting their diverse experiences in schools. For example, Dantley et al. (2008) pointed out that researchers tend not to adopt a broader intersectionality approach, and highlighted the limitation of "a feminist who mainly addresses gender issues or an African American who primarily does research on racism" (p. 125). Specific research gaps in quantitative intersectionality in education are as follows:

First, critical quantitative researchers consistently criticize essentializing the lived experiences of the Asian population and emphasize the importance of ethnic categorization in differentiating Southeast Asian students' experiences (Covarrubias

& Liou, 2014; Teranishi, 2007). Nevertheless, we still have limited knowledge about Southeast Asian female students from quantitative studies due to the data limitation of missing ethnic background variables in large administrated datasets (e.g., Covarrubias & Liou, 2014). Furthermore, studies disaggregating Asian students by ethnicity, class, or immigration status are often based on only simple descriptive statistics (e.g., Teranishi, 2007). Although simple descriptive statistics have shown the importance of considering multiple social categorizations when exploring Southeast Asian female students (e.g., Teranishi, 2007), more diverse quantitative explorations are needed to improve the educational outcomes for this particular student population. For example, quantitative intersectionality studies often omit different levels of analysis (e.g., organization, nation) to examine how schooling experiences and outcomes of students with multiple social categorizations intersect with organizational factors or contextual factors in society. The use of intersectionality focusing only on individual social categorizations undermines the use of intersectionality to provide practical knowledge for educational leadership to alleviate educational inequalities in schools.

Second, previous frameworks of quantitative research using a critical lens (i.e., CRQI or QuantCrit) are typically limited in exploring how systems of multiple discrimination and structural oppression produce differences for Southeast Asian women. As noted, this is because they mainly place race and racism at the core of the frameworks rather than multiple oppressions and marginalizations simultaneously. In this study, the critical quantitative intersectionality analysis instead aims to identify patterns of structural inequality in Southeast Asian female students' educational outcomes, which is simultaneously the product of multiple oppressions. In particular, McCall's (2005) inter-categorical (across groups) and intracategorical (within

groups) approach may be applicable to challenge assumptions of universal experiences and unpack complexity in educational outcomes of Southeast Asian female students within and across groups.

Furthermore, recent quantitative research has made limited use of the examination of the influence of multiple identities, focusing exclusively on student performance rather than examining diverse student experiences. In addition, scholars have often approached the gender gaps in math and reading scores in the same manner by aggregating these two subjects, even though those gaps in different subjects differ by students' gender (see Autor et al., 2015). Moreover, recent quantitative research has encountered a limitation in generalizing two intersecting identities in terms of the sample. For example, Quinn and Cooc (2015) specifically examined the national trends and determinants in science achievement gaps by gender and race or ethnicity or ethnicity in elementary and middle school (third through eighth grades) using the U.S. National Center for Education Statistics (NCES) Early Childhood Longitudinal Study, Kindergarten Class of 1998–1999 (ECLS-K: 99). However, this study is limited in understanding patterns related to the intersectional effect of students' identities on student outcomes in high school and higher education. Autor et al.'s (2015) study was also limited in generalizability to the nation as a whole as it used a sample of students in Florida, yet each state in the United States has a different educational context. Finally, the influence of SES intersecting with race or ethnicity and/or gender in intersectionality studies is still less explored than that of the intersectionality of race or ethnicity and gender.

Thus, the empirical investigation of this study at a meso-level aims to illuminate the overall pattern of intersecting marginalized identities among Southeast Asian students using nationally representative samples for the exploration of this

topic. In doing so, the empirical evidence and knowledge from this study can provide a rich generalizable explanation of the associations among identities and student experiences, especially for Southeast Asian girls. Its contribution to the literature lies in the depth that it adds to quantitative analyses and the generalizability it imparts to qualitative findings.

## Research Questions

In summary, this study proposes three main questions focusing on the multifaceted impact of students' historically marginalized identities (i.e., race or ethnicity, gender, and SES) on their experiences and educational outcomes as follows:

1. How is the convergence (i.e., intersectionality) of race or ethnicity, gender, and SES associated with schooling experiences of Southeast Asian female students?
2. How is the convergence (i.e., intersectionality) of race or ethnicity, gender, and SES associated with educational outcomes of Southeast Asian female students?
3. How do associations among the intersectionality of race or ethnicity, gender, SES and student experiences differ across schooling context for students overall? Do these patterns differ for Southeast Asian female students?

The first two questions aim to examine if the intersectionality of Southeast Asian female students' race or ethnicity, gender, and SES is associated with their schooling experience and educational outcomes. This study seeks to answer these questions because they are critical for helping researchers, educators, and leaders understand the multiplicative influence of multiple identities, which is distinct from

the summation of the singular identities' effects on students' experiences and educational outcomes. For example, this study intends to explore whether the relationship between being a Southeast Asian girl and the intention to enter higher education is simply the summation of each association of being Southeast Asian and being a girl, or the multiplicative associations. In addition, addressing these questions will provide an understanding about Southeast Asian students' unique educational experiences and outcomes, which are often masked in research due to the embedded model minority stereotype about Asian students. The third question further explores if school organizational characteristics differentiate the effects of intersectionality among race or ethnicity, gender, and SES on students' educational experiences and outcomes. Answering this question will not only expand our knowledge of the complexities of intersectionality in theory, but also provide practical knowledge that might help policymakers and educational leaders to resolve educational inequities and realize social justice in education.

# CHAPTER III: DATA AND METHODOLOGY

The previous literature review revealed that few quantitative studies have yet examined the multifaceted impacts of students' identities (race or ethnicity, gender, and socioeconomic status) focusing on Southeast Asian female students. In addition, there is scant literature that has explored the relationship between the multiplicative influence of students' multiple identities and school organizational characteristics. In order to fill these gaps, this study examines the following research questions: (1) How is the convergence (i.e., intersectionality) of race or ethnicity, gender, and SES associated with student experiences of Southeast Asian female students? (2) How is the convergence (i.e., intersectionality) of race or ethnicity, gender, and SES associated with educational outcomes of Southeast Asian female students? and (3) How do associations among the intersectionality of race or ethnicity, gender, SES and student experiences differ across schooling context for students overall? Do these patterns differ for Southeast Asian female students?

These research questions are important for educational leaders to develop the organizational capacity to support students based on understanding specific needs and characteristics particular to the experiences and educational outcomes of Southeast Asian female students. In addition, rich generalizable answers from these questions are useful for policymakers in their continuing efforts aimed at educational equity and social justice by challenging the assumption that education policy has equivalent influences on different students' experiences and outcomes.

In answering these research questions, this study is positioned as critical quantitative research employing intersectionality as an analytical framework. Stage and Manning (2016) specified the characteristics of critical epistemology; that is, (1) research purpose can be utilized to criticize social, political, and cultural systems as

well as to transform structural systems of oppression; and (2) research findings can be utilized for transforming unfair systems of power. As noted, this study critiques narrow perspectives in education policy and research aimed at addressing educational equity and social justice. Reflecting the purposes and uses of the research findings, this study is well aligned with critical epistemology (e.g., feminist theory, postcolonial theory, indigenous theory). Furthermore, in terms of its methodological approach, this study uses a quantitative method to contribute to our understanding of intersectionality theory and to explain its relevance to educational processes and outcomes. Using national-level data, this study, in its critical quantitative nature, attempts to illuminate inequities in the experiences of marginalized students, particularly Southeast Asian female students.

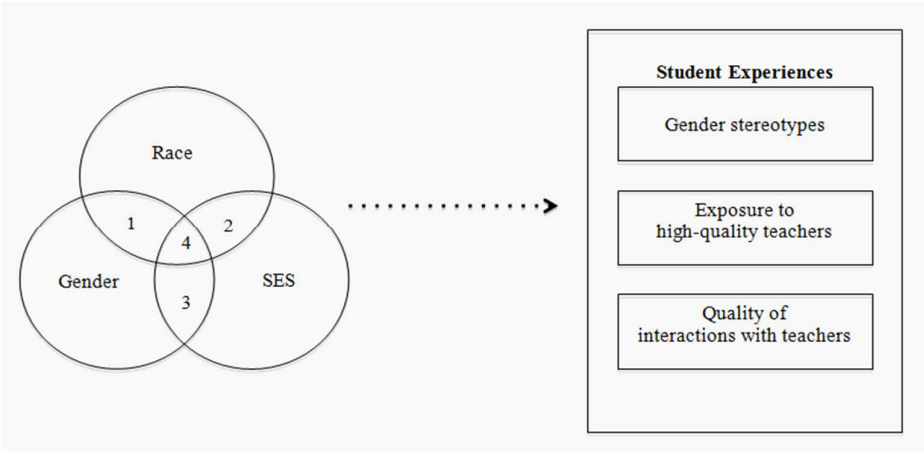
This chapter is organized into four sections. The first section provides a conceptual map of the relationships found in the literature among the variables of interest. The subsequent sections discuss data sources and research models employed to answer the research questions. The final section provides guidance for readers in terms of how to understand and interpret the study's findings.

## Conceptual Map

As noted, this study examines the relationship between the multiplicity of race or ethnicity, gender, and SES and student experiences and educational outcomes. The term *experience* in this study broadly represents psychological properties as well as a collection of the events or interpretation of them. Based on the definition, students' experiences include psychological properties (a student's gender stereotype) as well as events or the interpretation of them in schools (exposure to high-quality teachers and quality of individual interactions with teachers). Using the broad definition of student experience is important because such a concept allows for

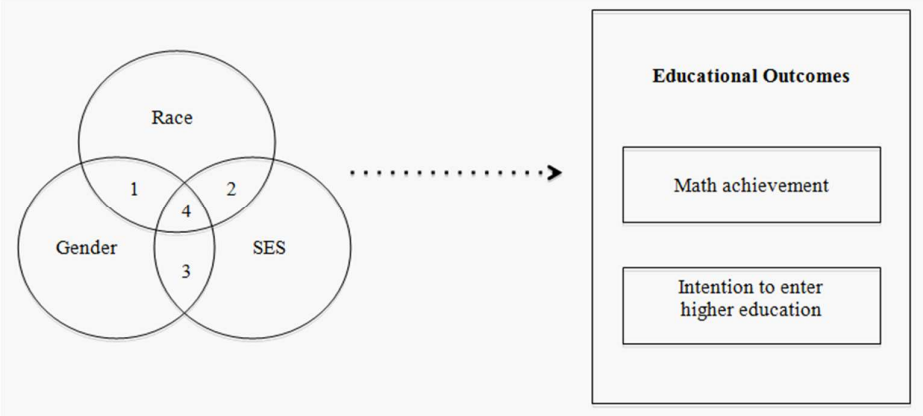
"digging deeper" (Warner & Shields, 2013, p. 808) into qualitatively distinct realities that students are exposed to in school and out of school according to their diverse identities. In addition, student outcomes include both knowledge (student performance) and a student's intention to enter higher education as measures of educational outcomes.

Figure III-1 and III-2 show that the inequities in students' experiences and educational outcomes can be associated with the multiplicities of students' identities. The unequal student experiences which stem from their diverse identities become more complex as these identities intersect with each other—namely, from intersectionality between race or ethnicity and gender (represented by 1 in the Venn diagram on the left side of Figure III-1 and III-2), race or ethnicity and SES (represented by 2), gender and SES (represented by 3), and race or ethnicity, gender, and SES (represented by 4). Figure III-1 and III-2, using dotted arrows, shows an explorative relationship where this study seeks to discover the associations between the multiplicities of students' identities and their experiences. Based on the relationship between such multiplicity and students' experiences, this study, as a critical quantitative study, aims to reveal diverse aspects of inequalities in students' experiences, which can affect students' educational outcomes.




[Figure III-1] Multiplicity of Student's Identities and Students' Experiences

Source: Author.

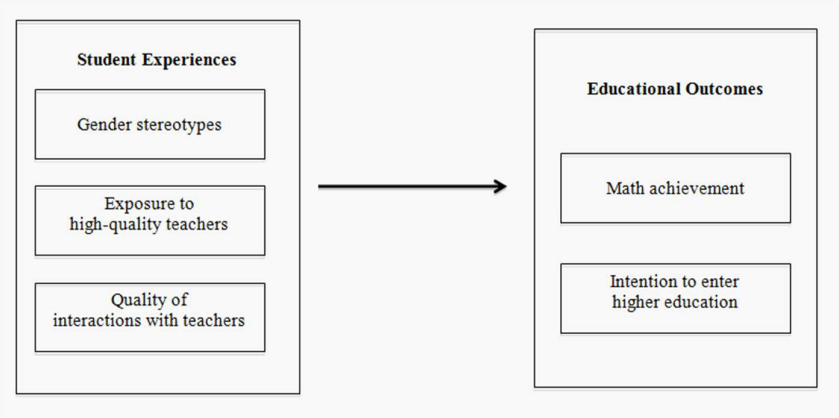



[Figure III-2] Multiplicity of Student's Identities and Students' Educational Outcomes

Source: Author.

As the literature review in Chapter II demonstrates, the multiple aspects of students' experiences can be closely related to students' multiple outcomes, as Figure III-3 illustrates. Intersectionality researchers who typically utilize qualitative methods and a critical lens might dissent from a functional model's mechanical approach, which is often based on a positivist paradigm. Nevertheless, this research

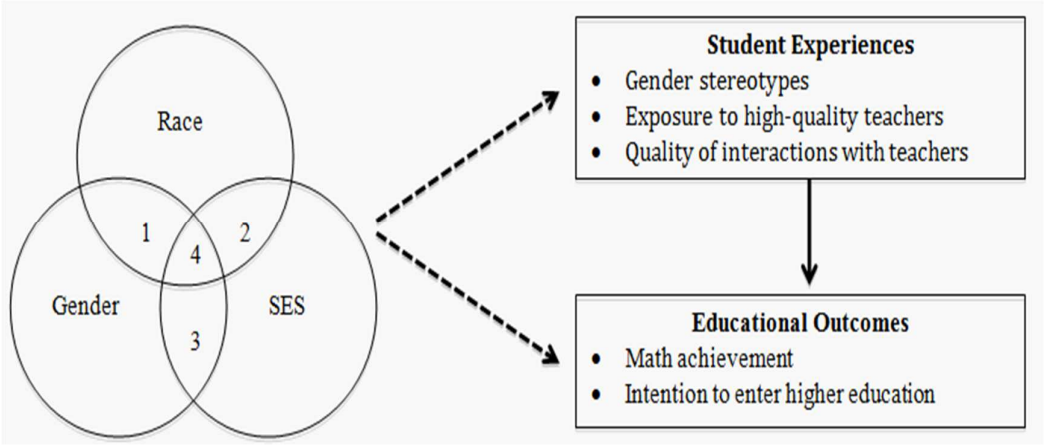
acknowledges that "scholars can learn from research conducted within all paradigms [including a production function approach]" (Stage & Manning, 2016, p. 33).




[Figure III-3] Students' Experiences Affecting Educational Outcomes

Source: Author.

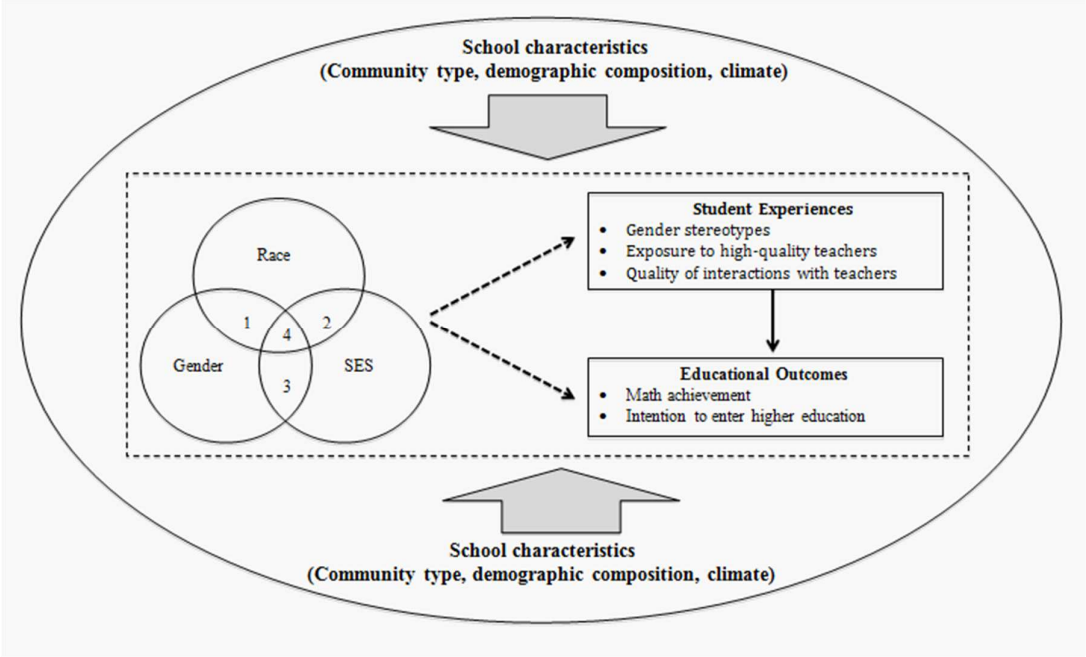
Combining Figure III-1, Figure III-2, and Figure III-3, Figure III-4, as a comprehensive model, synthesizes the conceptual map of this study based on the concept of experience and multiplicity of students' identities.




[Figure III-4] Multiplicity of Student's Identities, Students' Experiences, and Outcomes

Source: Author.

Finally, this research explores how the patterns of the convergence of students' multiple identities on their experiences and outcomes differ according to each school's climate as well as the school's demographic composition and community type. The added external circle in the educational processes, based on the multiplicity of student's identities, experiences, and outcomes, represents school organizational backgrounds and characteristics (see Figure III-5).




[Figure III-5] Conceptual Map of Multiplicity of Student's Identities, Experiences and Outcomes, and Organizational Characteristics

Source: Author.

## Data Source

This study uses restricted-use national longitudinal data, High School Longitudinal Studies 2009 (HSLS:09) provided by the National Center for Education Statistics (NCES). As the most recent national-level longitudinal study, HSLS:09 has tracked sample populations of high school students from the beginning of high school into postsecondary education, the workforce, and beyond, especially

emphasizing science, technology, engineering, and math (STEM) education. The HSLS:09 dataset includes a nationally representative sample gathered from more than 23,000 ninth-grade students in 944 schools since 2009. An average of 25 ninth-grade students per school were randomly selected from sampled schools. In addition, a stratified, two-stage random sample design was used to acquire the sample schools, including both public and private schools. The first stage of stratified random sampling identified 1,889 eligible schools, and a primary sampling unit (PSU) was selected from the 2005-2006 Common Core of Data (CCD) of NCES. In the second stage of stratified random sampling, about 28 students per school were randomly selected from those identified schools (National Center for Education Statistics, 2011).

The stratified two-stage random sample design of HSLS:09, which is a complex sampling design (Lumley, 2010; Rabe-Hesketh & Skrondal, 2006), typically creates two critical concerns for analysis: (1) non-independence among units because of the non-simple random sampling design and (2) disproportionate sampling resulting in unequal selection probabilities (Hahs-Vaughn, McWayne, Bulotsky-Shearer, Wen, & Faria, 2011). By not addressing these matters of HSLS:09 originating from the complex sampling design, the analysis will create biased standard errors (i.e., increased probability of a Type I error) and parameter estimates (Hahs-Vaughn et al., 2011; Stapleton, 2002). In order to address these complex sampling concerns, researchers typically apply Taylor series linearization or replication methods (see Hahs-Vaughn et al., 2011). In particular, this study employs balanced repeated replication (BRR) methods to ensure that the results are representative of the population and calculation of the variance and parameter

estimates (see Hahs-Vaughn et al., 2011 for specific details and explanation about replication methods).

The HSLS:09 dataset has the following advantages for this study. First, the HSLS:09 dataset includes specific contextual information about students' backgrounds. In addition, as the HSLS:09 dataset is the most recent national representative data, it allows us to discern relatively up-to-date generalizable inequities in diverse aspects of students' experiences and outcomes in American schools. Second, the HSLS:09 dataset also includes specific information about math and science teachers' background information separately (e.g., teaching experience in the subject and the degree earned), allowing us to control for other factors possibly related to teacher quality (Darling-Hammond, Holtzman, Gatlin, & Heilig, 2005; Goldhaber & Brewer, 2000; Wenglinsky, 2001). Finally, with a two-level hierarchical structure (at the student and school levels), the HSLS:09 dataset includes rich organizational information from the school level in the restricted-use data. This information includes school characteristics (e.g., demographic composition of student body, community type, characteristics of school climate). The school-level data will be useful for school leaders and policymakers to understand existing inequities based on different organizational characteristics.

The HSLS:09 consists of five sub-data sets based on different data collection waves: base year (2009), first follow-up (2012), 2013 update (2013), high school transcripts (2013–2014), and second follow-up (2016). Of these data sets, this study uses the base-year data collected in the fall term in 2009 and focuses on ninth graders' educational outcomes as a powerful predictor for their future educational outcomes, including graduation (Allensworth & Easton, 2005; McCallumore &

Sparapani, 2010), eleventh-grade achievement (Easton, Johnson, & Sartain, 2017), and college enrollment (Easton et al., 2017).

There are several limitations in using data from the existing large-scale survey to analyze intersectionality, which encompasses multiple and diverse identities. That is, as surveys are typically not designed to examine the intersectionality of diverse identities, a limited number of cases with multiple identities that quantitative researchers attempt to examine can present a critical issue regarding insufficient statistical power (Hancock, 2007; McCall, 2005). In addition, the use of mechanistic categories belies the fluid and complex nature of identities, which the conceptual foundations of intersectionality emphasize. Furthermore, as the researcher will not actually speak with students about their identities of race or ethnicity, gender, and socioeconomic status, quantitative researchers cannot determine directly how multiple intersecting identities are associated with students' experiences and educational outcomes. These limitations are a critical reason that intersectionality researchers often prefer to use qualitative methodologies (e.g., counterstorytelling, narrative inquiry, ethnographic inquiry) that "more naturally lend themselves to the study of complexity and reject methodologies that are considered too simplistic or reductionist" (McCall, 2005, p. 1772). However, critical quantitative researchers often criticize intersectionality scholars who use qualitative approaches as overly subjective in that they might see in the data what they expect to find (Stage & Manning, 2016). In this regard, intersectionality studies using quantitative approaches can contribute to an understanding of intersectionality in coordination with findings of qualitative intersectionality studies by providing objective evidence using a large-scale dataset. The next section specifically describes

variables of interest, including how these identity categories are quantified through the process of coding.

**Student Identities**

This study focuses on intersections of three different aspects of students' identities: race or ethnicity, gender, and socioeconomic status (SES). Quantitative analyses utilizing these three identities in this study should not be interpreted as causality (e.g., race effect), but as statements of associations between the identities and outcome variables. Furthermore, these associations related to multiple identities represent oppressive forces (e.g., racism, sexism, capitalism, colonialism) (Zuberi, 2008). Among these identities, this study uses the following processes of coding to create quantitative identity categories for race or ethnicity and gender.

**Race or ethnicity.** In terms of race or ethnicity, white students were coded 0 and served as the reference group. White students served as the reference because educational research typically establishes a white group as the reference to explore patterns of educational inequity of racial minority students. This study focuses on Southeast Asian high school girls and uses interactions including Southeast Asian, gender, and SES (e.g., Southeast Asian × Female, Southeast Asian × SES). Five dummy variables (i.e., Black, Hispanic, American Indian/Alaska Native, Southeast Asian, and Asian students who are not Southeast Asian students) were used separately to compare each student of a different race or ethnicity to white students; these students were coded 1 for their respective categories, 0 otherwise. As this study excluded students who identified as more than one race or ethnicity (6.2% of the sample), this coding for race or ethnicity covers 93.8% of the student population sampled. Race or ethnicity was based on the HSLS:09 restricted-use data from the student self-identified questionnaire. In particular, for the Black, Hispanic, and

American Indian/Alaska Native categories, this study uses Black (X1BLACK), Hispanic (X1HISPANIC), and American Indian/Alaska Native (X1AMINDIAN) composite variables from the HSLS:09 dataset. In addition, this study uses the Asian origin variable (S1ASIANOR), which is only available from the restricted dataset, to create the Southeast Asian and Asian who are not Southeast Asian categories.

**Gender.** In terms of gender, the female variable is used by coding female students 1 and male students 0 (i.e., the reference group) based on data from the student questionnaire (X1SEX). The school-provided sampling roster or the parent questionnaire supplemented the data if this information was missing.

**Socioeconomic status (SES).** This study uses the SES index score (X1SES) that was calculated by NCES in the HSLS:09 dataset. The SES index score was measured based on a family's relative position in society, including the following components: education of each parent or guardian or of the single parent/guardian; the occupational prestige score of each parent or guardian or of the single parent/guardian; and family income. All SES components were derived from the parent questionnaire. The SES index score indicates a student's family position in a vertical social hierarchy. A lower SES index score indicates a relatively lower socioeconomic status for a student's family and vice versa.

**Student Experiences**

The multiple aspects of students' experiences and characteristics include (1) gender stereotypes about males' superior math abilities, (2) exposure to high-quality teachers, and (3) quality of individual interactions with their teachers (i.e., teacher's expectations of students, teacher's treatment in terms of respect, and teacher's fairness). All variables are taken from student questionnaires. Among these

variables, the variables of gender stereotypes and teachers' graduate degree in teacher quality are categorical variables.

**Gender stereotypes about males' superior math abilities**. The first variable of students' experiences measures a student's gender stereotypes about males' superior math abilities. This variable is obtained from the student questionnaire asking how a student compares males and females in math (S1MTHCOMP). To identify specifically the gender stereotypes about males' superior math abilities, I recoded the five Likert scale answers into two categories: no stereotype ("females and males are the same") or gender stereotypes about females' superior math abilities ("females are much better" and "females are somewhat better") were coded 0 and served as the reference group; the scale of "males are somewhat better" and "males are much better" were coded 1. The coded gender stereotypes in math becomes a dichotomous dependent variable, which is used in logistic regression analysis.

**Exposure to high-quality teachers**. In light of the criticisms of using only measures of student achievement as a part of students' experiences in schools, this study includes teacher quality in addition to the perception of math skills. In addition, including exposure to high-quality teachers in the analyses is important, because student performance and psychological characteristics can be affected by teacher characteristics related to teacher quality (e.g., Clotfelter et al., 2010; Goldhaber, 2002; Hanushek, 2007; Harris & Sass, 2011). For example, previous research determined that teacher quality was distributed unequally across students, where students of color typically had fewer high-quality teachers, as defined by the literature (e.g., Goldhaber et al., 2015). I measure teacher quality based on information about teaching experience in math and the highest degree earned—

traditional measures of teacher quality. Recent literature exploring teacher quality has increasingly turned to value added models (VAM), which evaluate teacher quality by the increase in student achievement scores tied to that teacher. Nevertheless, scholars have argued that VAM are not reliable for measuring individual teacher quality (Koretz, 2008; Darling-Hammond, 2015). In addition, scholars still use these traditional measures (i.e., teaching experience, graduate degree) to investigate the concept of teacher quality (e.g., Goldhaber et al., 2015; Harris & Sass, 2011; Henry et al., 2014). A math teacher's teaching experience is a continuous variable indicating years the math teacher has taught high school math. In addition, the indicator variable of a math teacher's highest degree earned equals 1 if the math teacher earned a master's degree or above; a teacher with a bachelor's degree was coded 0 and served as the reference group.

**Quality of individual interactions with teachers.** This study further hypothesizes that individual interactions with teachers might differ according to students' race or ethnicity, gender or socioeconomic status based on the argument that student experiences in schools are not monolithic. The specific characteristics of a student's interactions with math teachers include a student's perceptions of teacher expectations, teacher's treatment in terms of respect, and teacher's fairness. A math teacher's expectation of students is obtained in the questionnaire (S1MTCHCONF), asking how much a student agrees with the statement that his or her teacher thinks all students can be successful. A math teacher's treatment in terms of respect is also obtained in the questionnaire (S1MTCHRESPCT), asking how much a student agrees with the statement that his or her teacher treats students with respect. Finally, perception of a math teacher's fairness is obtained in the questionnaire (S1MTCHFAIR), asking how much a student agrees with the statement that his or

her teacher treats every student fairly. The variable of quality of a student's interaction with teachers was created by calculating the average of these three measures (Cronbach α = .90). Note that the quality of individual interactions with teachers reflects students' perceptions of the relationship between teacher and student, rather than an objective measure of teacher quality (i.e., years of experience, graduate education).

**Educational Outcomes**

This study uses two dependent variables to measure educational outcomes: standardized mathematics achievement score and intention to enter higher education. The mathematics score is an objective measure for achievement, and a student's intention to enter higher education is based on student perceptions from the student questionnaire.

First, this study uses 9th graders' math standardized theta scores for math achievement scores. The mathematics assessments measured ninth-grade students' achievement in algebra. The students' mathematics achievement scores are based on item response theory (IRT). The math achievement score (X1TXMTSCOR) is a continuous variable and a ratio measurement using a 100-point test. The math achievement score was used as the only curriculum-related variable because previous studies have shown the association between high school math achievement and students' future academic success, such as college success (e.g., Claesens & Engel, 2013; Lee, 2012).

Second, a student's intention to pursue postsecondary education is also obtained from the questionnaire (X1STUEDEXPCT) and is taken from the question asking how far in school the 9th grader thinks he/she will get. Dichotomous coding is used for the 10-point categorical answers: high school diploma/General Educational

Development (GED) or less than high school was recoded as 0 and served as the reference group whereas all categories at or above a bachelor's degree were coded as 1.

**School Characteristics**

This research explores how the patterns of the convergence of students' multiple identities on their experiences and characteristics differ according to each school's climate, school's community type, and demographic composition (i.e., percentages of free or reduced lunch eligible students and students of color). These data were obtained from the HSLS:09 school-level dataset.

**School climate**. This study broadly defined school climate as the prevailing influence or environmental conditions characterizing a school. Based on the definition of school climate and theoretical foundation (Berkowitz et al., 2017), this study calculated a school's climate by averaging students' and mathematics and science teachers' perceptions about the school's characteristics related to school climate. Note that this study focuses on math and science to reflect the underrepresentation of women and people of color in STEM fields. Thus, this study also examines the perceptions of math and science teachers. Data for other members of the community were not included for the school climate measure because of data limitations.

Students' perceptions related to school climate included engagement in the school (X1SCHOOLENG) and feelings of safety at school (S1SAFE). The variable of school engagement was created by NCES through a principal factor components analysis, with a mean of zero and standard deviation (SD) of one. Higher values in the school engagement variable indicate greater school engagement. In addition, the variable of feelings of safety at school measures how safe a 9$^{th}$ grader feels at school;

the lower value indicates the safer the student felt. I reverse-coded the four-point scale answers of the variable for feelings of safety at school. Thus, the higher the value of reverse-coded feeling of safety at school indicates the safer the student felt. All variables for students' perceptions to measure school climate were standardized with a mean of zero and an SD of one, except the composite variables already standardized by NCES, to merge with teachers' perceptions.

Teachers' perceptions about school climate (i.e., teachers' beliefs in and support for their students) were obtained from the teacher questionnaire. In particular, teachers' perceptions regarding school climate included whether (1) teachers believed that all students could do well (M1BELIEVE); (2) teachers worked hard to ensure that all students learned (M1WORKHARD); and (3) teachers explored approaches for underperforming students (M1SHRAPPRCH). All answers to the three-point scale were coded as the higher value indicates a positive view; "disagree or strongly disagree" was recoded 0 and served as the reference group, "agree" was coded 1, and "strongly agree" was coded 2. Compared to a nominal scale (often called a categorical or indicator variable) for unordered and mutually exclusive categories, these three variables are ordinal scales that are applied to mutually exclusive and ordered perceptions. Thus, the coded value of two (strongly agree) compared to the value of one (agree) indicates higher perceptions of positive school climate among teachers. Note that these ordinal variables do not directly fit in the models, but these sets of variables are combined to form index scores for school climate, enabling the ordinal scales to be analyzed as interval values (Brown, 2011).

All variables to measure school climate were standardized with a mean of zero and an SD of one, except the composite variables already standardized by NCES. This allowed for the use of the same unit of measurement across variables,

thereby creating an average score of variables related to perceptions of school climate from students and mathematics and science teachers. Although the majority of scholars measure school climate by focusing only on students' perspective, there are a few scholars who have used different measures from multiple perspectives (i.e., students, teachers, and parents) to measure school climate (e.g., Brand, Felner, Seitsinger, Burns, & Bolton, 2005; Booren, Handy, & Power, 2011; Snyder, Vuchinich, Acock, Washburn, & Flay, 2012). As school climate is a multidimensional composite (Berkowitz et al., 2017), measurements from multiple perspectives "represent different but equally valid aspects of experiences" (Wang & Degol, 2016, p. 335).

**Community type**. Community type (X1LOCALE) provides details on the local context of the school—namely, whether it is located in a city, suburban area, town, or rural area. This study consolidated school community types into three (not four) categories by combining towns and rural areas. This new category (rural and towns) served as the reference group for analysis.

**School's demographic composition**. Schools' demographic composition indicates the percentage of students of color and free or reduced lunch eligible (FRL) students in a school. The school-level HSLS:09 dataset provides information on the percentages of Hispanic, Black, Asian or Pacific Islander, and American Indian or Alaska Native students in a school. Thus, this study calculates the percentage of students of color in a school by totaling these four variables. In addition, this study uses the variable for the percentage of students enrolled in the school who receive free or reduced price lunch from the school-level HSLS:09 dataset. Table III-1 summarizes specific measures for variables of interest used for this study and variable names in the HSLS:09 dataset.

Table III-1

*Variables and Data Sources of This Study*

| | Variable | Subcategory | Variable name |
|---|---|---|---|
| Identity | Black | | X1BLACK |
| | Hispanic | | X1HISPANIC |
| | Southeast Asian | | S1ASIANOR |
| | Other Asian/Pacific Islander | | S1ASIANOR |
| | American Indian/Alaska Native | | X1AMINDIAN |
| | Gender | | X1SEX |
| | SES | | X1SES |
| Experience | Self-stereotype | | S1MTHCOMP |
| | Interactions with teachers | Fairness | S1MTCHFAIR |
| | | Expectations | S1MTCHCONF |
| | | Respect | S1MTCHRESPCT |
| | Teacher quality | Degree | M1HIDEG |
| | | Teaching experience | M1MTHYRS912 |
| Outcomes | Math achievement score | | X1TXMTSCOR |
| | Intention to pursue postsecondary education | | X1STUEDEXPCT |
| School | Community type | | XlLOCALE |
| | Percentage of FRL students | | X1FREELUNCH |
| | Demographic composition | | A1HISPSTU, A1BLACKSTU, A1ASIANPISTU, A1AMINDIANST |
| | Climate | Students' perceptions | X1SCHOOLENG, S1SAFE |
| | | Teachers' perceptions | M1BELIVE, M1WORKHARD, M1SHRAPPRCH |

Source: Compiled by the author from the HSLS:09 dataset.

## Research Models

This study utilizes three statistical research techniques to answer the proposed research questions: multiple regression, logistic regression, and linear mixed effect modeling (LMM). The following sections address specific details about the research models and analytical techniques based on the research questions.

### Research Model for Intersectionality and Student Experiences and Outcomes

In order to examine the intersectionality of students' multiple identities and student experiences as well as educational outcomes—namely, research questions (1) and (2)—this study uses multiple regression and logistic regression. The multiple regression models for research questions (1) and (2) examine the association between the convergence of students' identities (race or ethnicity, gender, and SES) and student experiences and outcomes for continuous variables. In addition, the logistic regression models for these questions were used for three dichotomous dependent variables (i.e., a student's intention to enter higher education, gender stereotypes about males' superior math abilities, and whether or not a math teacher has a graduate degree). Note that this study uses students' schooling experiences as dependent variables for research question (1), which includes gender stereotypes about males' superior math abilities and whether or not a math teacher has a graduate degree. In addition, this study includes educational outcomes (math achievement, a student's intention to enter higher education) as dependent variables for research question (2). Independent variables in multiple and logistic regression for research questions (1) and (2) are students' race or ethnicity, gender, and SES. In addition, the multiple and logistic regression models include the interaction effects, denoting additional effects above and beyond the sum of the main effects of singular identity (see Equation (1)). Based on these statistical interaction effects, this study aims to

identify unique contributions of converging multiple identities, rather than using an additive approach that statistically considers only the main effects of multiple singular identities (e.g., double jeopardy theory). In addition, this study employs dependent variables related to schooling experiences (i.e., gender stereotype, quality of interactions with teachers, and teacher quality) as well as educational outcomes (i.e., standardized mathematics achievement score and intention to purse postsecondary education). In particular, this study employs the following multiple regression models:

$$\text{Student Experiences or Educational Outcomes} = \beta_0 + \beta_1 \cdot (\text{Black}) + \beta_2 \cdot (\text{Hispanic}) + \beta_3 \cdot (\text{American Indian/Alaska Native}) + \beta_4 \cdot (\text{Southeast Asian}) + \beta_5 \cdot (\text{Other Asian/Pacific Islanders}) + \beta_6 \cdot (\text{Female}) + \beta_7 \cdot (\text{SES}) + \beta_{8\sim12} \cdot (\text{Race or ethnicity}) \times (\text{Female}) + \beta_{13\sim17} \cdot (\text{Race or ethnicity}) \times (\text{SES}) + \beta_{18} \cdot (\text{Female}) \times (\text{SES}) + \beta_{19\sim23} \cdot (\text{Race or ethnicity}) \times (\text{Female}) \times (\text{SES}) \quad (1)$$

where student experience includes gender stereotype, quality of interactions with teachers, and exposure to quality teachers (i.e., teaching experience and graduate degree); gender stereotype is a categorical variable, labeled one for those students who have a stereotype that males are better than females in math and science abilities; quality of interactions with teachers is the average score of teacher expectations, teacher's treatment in terms of respect, and teacher's fairness; teacher graduate degree is a categorical variable, labeled one for those teachers who have a master's degree and above and zero otherwise; teaching experience is a continuous variable, measuring the number of years during which a teacher has been teaching; educational outcomes are students' short- and long-term educational outcomes including standardized mathematics achievement score and intention to enter higher education; and race or ethnicity includes five different race or ethnicity groups (i.e.,

black, Hispanic, American Indian/Alaska Native, Southeast Asian, and Other Asian/Pacific Islanders). Note that this study used the maximum likelihood (ML) estimation for these multiple regression models to address the issues of complex sampling (non-independence among units, disproportionate sampling) by using Mplus software.

**Research Model for Intersectionality, Experiences, Outcomes, and Organizational Characteristics: LMM**

A critical purpose of this study is to identify school factors that can mediate the effect of convergence of multiple marginalized identities attached to students' race or ethnicity, gender, and SES on student experiences and educational outcomes. In order to address a hierarchical structure in the dataset with students grouped in schools, this paper uses linear mixed effect modeling (LMM). Scholars often refer to LMM as a hierarchical linear model or multi-level model. This study uses LMM for the following reasons. First, LMM is a widely used method in education as well as social sciences, biostatistics, economics, because it is a robust analytical method for addressing issues associated with hierarchical data (i.e., non-independence of observations). In particular, as the student data in the HSLS:09 dataset is nested within the school-level data, students in a school share variance according to their common school characteristics. Due to the shared variance among students, the HSLS:09 dataset creates non-independence of observations. Second, LMM has an advantage in addressing missing data. In particular, traditional linear models often use a listwise-deletion approach, causing the loss of the whole case (i.e., student) that includes any missing variable. However, in LMM, the remaining data in each case will be retained for the analysis, even when variables are missing.

The LMM includes three factors: fixed effects, random effects, and errors. The fixed effects are the average coefficients that influence the process of change for all students. The random effects are the differences between individual coefficients and population parameters. That is, random effects inform us if the fixed coefficients vary across schools. Finally, errors refer to the residual unexplained by the fixed and random effects. Based on these three components, the general mixed-effect model is as follows:

$$\mathbf{y}_i = \mathbf{X}_i\boldsymbol{\beta} + \mathbf{Z}_i\mathbf{b}_i + \mathbf{e}_i \quad (2)$$

where $\mathbf{X}_i$ is the $n_i \times p$ design matrix of the fixed effects, $\boldsymbol{\beta}$; whereas $\mathbf{Z}_i$ is the $n_i \times r$ design matrix for the random effects representing between-school variation, where $\mathbf{e}_i \sim N(0, \boldsymbol{\Lambda}_i)$ and $\mathbf{b}_i \sim N(0, \boldsymbol{\phi})$; $\boldsymbol{\phi}$ is the variance-covariance matrix, composed of the variance of random effects and the covariance between random effects; and $\boldsymbol{\Lambda}$ is the error structure indicating the residual. The variance components including variances-covariances of random effects that contain potentially useful information regarding individual differences are estimated using maximum likelihood (ML). ML is the method by which parameter estimation is tied to a particular distribution in order to find the distribution that best matches the data.

Based on Equation (2), an unconditional model showing if average scores of dependent variables differ across schools can be rewritten as a hierarchical linear model (HLM) or multi-level model as follows:

$$\begin{aligned} Y_{ij} &= \beta_{0j} + e_{ij} \\ \beta_{0j} &= \gamma_{00} + u_{0j}, \end{aligned} \quad (3)$$

where $Y_{ij}$ is the educational experiences and educational outcomes of the $i^{th}$ student in the $j^{th}$ school, $\beta_{0j}$ is the average of dependent variables (intercept) for the $j^{th}$ school;

$\gamma_{00}$ is the average of dependent variables across schools; $e_{ij}$ is a student-level residual; and $u_{0j}$ is the unique effect of the $j^{th}$ school.

This study includes only statistically significant student-level predictors based on the results from multiple regression and logistic regression analyses and five school-level predictors into Equation (3). Equation (4) shows the student- and the school-level equations as a final model to answer research question (3), which addresses the question of the relationship between organizational characteristics and intersectionality among race or ethnicity, gender, and SES.

Student-level:

$$(\text{Experiences or Outcomes})_{ij} = \beta_{0j} + \beta_{1j} X_{1j} + \beta_{2j} X_{2j} + \ldots + \beta_{nj} X_{nj} + e_{ij}$$

School-level:

$$\beta_{0j} = \gamma_{00} + \gamma_{01} (\text{Suburban School})_j + \gamma_{02} (\text{Rural School})_j + \gamma_{03} (\text{Percentage of FRL students})_j + \gamma_{04} (\text{Percentage of Students of Color})_j + \gamma_{05} (\text{School Climate})_j + u_{0j},$$

$$\vdots$$

$$\beta_{nj} = \gamma_{n0} + \gamma_{n1} (\text{Suburban School})_j + \gamma_{n2} (\text{Rural School})_j + \gamma_{n3} (\text{Percentage of FRL students})_j + \gamma_{n4} (\text{Percentage of Students of Color})_j + \gamma_{n5} (\text{School Climate})_j + u_{nj}, \quad (4)$$

where $\gamma_{01}$ is the school-level slope capturing the difference of being in a suburban from being in an urban area (reference group) on average experiences or outcomes; $\gamma_{02}$ is the school-level slope capturing the difference of being in a rural or town from being in a urban area on average experiences or outcomes; $\gamma_{03}$ is the school-level slope capturing the effect of the percentage of FRL students on average experiences or outcomes; $\gamma_{04}$ is the school-level slope capturing the effect of the percentage of

students of color on average experiences or outcomes; and $\gamma_{05}$ is the school-level slope capturing the effect of the school climate on average experiences or outcomes. A student's SES index score and percentages of FRL students and SES students in a school were grand-mean centered for the purpose of meaningful interpretations.

**Model Selection**

This study used three criteria for goodness-of-fit tests to compare the performance of models (i.e., base models without interaction terms versus full models with interaction terms): (1) deviance test, (2) the Akaike information criterion (AIC), and (3) Bayesian information criterion (BIC). In particular, a deviance statistic (-2Loglikelihood) for each base model and full model including interactions is computed for deviance tests. The larger the deviance the poorer the fit to the data. Because a deviance test alone is not enough to determine which model is better, this study also used information-based criteria assessing model fits (i.e., AIC and BIC). AIC seeks to find the model that best approximates the true one and provides information about whether a more complicated model fits better than a simple one. On the other hand, BIC is supposed to identify the true model. BIC penalizes models that are over-parameterized and adjusts for the number of observations. A model with lower values of AIC and BIC indicates the better fitting model. For specific details regarding AIC and BIC, see Burnham and Anderson (2004).

**Statistical Software**

This study uses two statistical software packages for the different research models: SPSS and Mplus. SPSS software was used to analyze descriptive statistics and to obtain the measure for reliability (Cronbach α). Mplus was used to conduct multiple regression analyses [research questions (1) and (2)] as well as LMM

[research question (3)] to calculate appropriate standard errors based on differences between estimates from the full sample and a series of created subsamples (see Hahs-Vaughn et al. 2011). This study also used base-year student-level weights to account for differential selection probabilities and differential patterns of response or non-response.

**Missing Values**

Missing values are a critical challenge that can decrease the sample size, resulting in the sample not properly representing the population. However, Ingels et al. (2011) emphasized that "HSLS:09 variables in general did not suffer from high levels of item nonresponse" (p. viii). In particular, the percentages of missing values in focal independent variables (i.e., gender and SES), student schooling experience (gender stereotypes, a teacher's having a graduate degree, years of teaching experience), and educational outcomes (math achievement, intention to enter higher education) were less than 5% of those variables. There were two exceptions showing more than 5% missing values: (1) a student's race or ethnicity (6.2%) because this study excluded students who identified as more than one race or ethnicity; and (2) a student's interactions with his/her math teacher (12.5%). The limitation of not considering multiracial status in this analysis will be discussed in Chapter 5. Furthermore, potential issues and remedies for these missing values are discussed below.

Fitzmaurice, Laird, and Ware (2004) highlighted three issues related to missing observations. First, when the data are missing, the dataset becomes unbalanced over time. Second, a loss of information and a reduction in precision occur. Third, certain assumptions about the reasons for any missing information, called the missing data mechanism—such as missing completely at random

(MCAR), missing at random (MAR), and not missing at random (NMAR)—are required. MCAR indicates that missing values do not depend on any other variables, whether observed or unobserved. MAR represents a systematic missingness depending on observed variables, but not unobserved missing values. For example, Southeast Asian female students might be less likely to report their intention to pursue higher education. NMAR, however, is the case when the probability of a missing value depends on the variable that is missing. For example, respondents with low intention to enter higher education are less likely to report their intention to pursue higher education.

MCAR provides a positive feature of data, as the analysis remains unbiased. However, this assumption for MCAR typically does not hold for survey data (Ingels et al., 2011), such as the HSLS:09. Furthermore, it is technically difficult to test if the missing values are MAR or NMAR because testing NMAR requires having the value of the missing observation, which the dataset obviously does not include. Whether or not the missingness is caused by MAR or NMAR, Schafer and Graham (2002) emphasized that maximum likelihood (ML) estimation such as that used in this study are often unbiased. As noted, this study uses Mplus software that employs the ML estimation for univariate analyses to address the issues of complex sampling (i.e., non-independence among units, disproportionate sampling). LMM for research question (3) is also estimated based on the maximum likelihood method (see Schafer and Graham, 2002 for technical details on how procedures of ML address MAR and NMAR to achieve unbiased estimates). Thus, these missing values should not significantly affect the results of further analysis.

## Guide for Understanding the Findings

An interpretation of statistical interaction terms in quantitative

intersectionality studies can be challenging, not only for policymakers and educational leaders, but also for researchers. Thus, this section offers guidance to an understanding of intersectionality by offering examples using two-way and three-way interaction terms.

**Intersectionality of Two Identities: Two-Way Interactions**

Scholars typically utilize interaction models focusing on two-way interactions or three-way interactions based on the number of independent variables included in interaction terms. In Equation (1), there are eleven two-way interaction terms ($\beta_8$ through $\beta_{18}$). Among those identity variables used in the interaction terms, six variables are qualitative predictors or indicator variables (Black, Hispanic, American Indian/Alaska Native, Southeast Asian, Other Asian/Pacific Islanders, and Female) and one variable is a continuous variable (SES index score). It is noteworthy that the variables in the interaction terms might be both qualitative in nature, or one might be continuous and the other qualitative.

First, as an example of an interaction term including a continuous variable, this study examines whether the effect of SES on students' experiences and educational outcome is different for males and females. In this case, a researcher can declare SES the focal independent variable and gender the moderator variable and, vice versa. Thus, when SES is the focal independent variable, this study investigates whether the regression coefficient when regressing students' experiences and educational outcomes onto SES for males is different from the corresponding regression coefficient for females. If the regression coefficient of the interaction term between Female and SES ($\beta_{18}$) in Equation (1) is statistically significant, the interpretation will be that gender moderates the impact of SES on students' experiences and educational outcomes.

Second, in the instance of an interaction term including both qualitative variables, this study examines whether the effect of gender is different for Southeast Asian students than for other racial or ethnic groups. The regression coefficient for Female ($\beta_6$) in Equation (1) indicates the mean differences in students' experience and educational outcome between males (Female = 0) and females (Female = 1). If the coefficient for the interaction term of Southeast Asian × Female is statistically significant, the gender difference in a dependent variable is conditioned on whether a student is Southeast Asian or not. In other words, the coefficient for the interaction term ($\beta_{11}$) represents the difference between educational outcomes and experiences of Southeast Asian female students and three other groups (Southeast Asian males, males who are not Southeast Asian, and females who are not Southeast Asian).

**Intersectionality of Three Identities: Three-way Interaction**

This study uses three-interaction terms ($\beta_{19}$ through $\beta_{23}$) to examine the association between intersectionality of race or ethnicity, gender, and SES and students' schooling experiences and educational outcomes. For the three-way interaction term with a continuous predictor (SES) and two qualitative predictors (race or ethnicity and gender), Jaccard and Turrisi (2003) recommend that one makes the continuous predictor the focal independent variable and the two other qualitative variables serve as moderator variables, for one potential way of interpretation. Thus, the interpretation of the significant regression coefficient for the three-way interaction term is a "difference of slope differences" (Jaccard & Turrisi, 2003, p. 54). That is, the statistically significant three-way interaction term (Southeast Asian × Female × SES) indicates that the effect of SES on students' experiences and outcomes, specifically for Southeast Asian female students, is different from the other groups.

# CHAPTER IV: FINDINGS

This chapter presents the findings from the analyses examining the association among intersectionality of race or ethnicity, gender, and SES and Southeast Asian female students' experiences and educational outcomes. In particular, this chapter consists of four sections: The first section provides an overview of univariate analysis among key variables of interest. The descriptive statistics of key variables of interest is presented by race or ethnicity and gender across SES, which are the key intersectionality identities of this study. The second section looks at bivariate analysis showing how key variables of interest correlate with each other. The third section reports the results of the multivariate analysis and organizes the discussion according to three research questions, specifically: research question (1), the association between the intersectionality of race or ethnicity, gender, and SES and Southeast Asian female students' experiences (i.e., gender stereotypes, quality of interactions with teachers, and teacher quality); research question (2), the association between the intersectionality of race or ethnicity, gender, and SES and Southeast Asian female students' educational outcomes (i.e., math achievement score and intention to enter higher education); and research question (3), how the patterns of intersectionality in students' experiences and educational outcomes differ by schooling contexts.

Table IV-1 presents the demographic composition of sampled ninth graders in the United States in 2009. Note that this study excludes students who identified as more than one race (6.2% of total population). This percentage of students who identified as more than one race (6.2%) for this data was higher than the percentage of the total population (2.9%) according to the data from the U.S. Census Bureau (2012). This difference between the percentages of students and the Census

population might be because the Census population might be more likely to choose one specific race/ethnic category than teenagers who are still developing their race/ethnic identities (Cross et al., 1999). Among Asian/Pacific Islander students (6% of total population), 37% (2.2% of total population) identified themselves as Southeast Asian, such as Vietnamese, Thai, Cambodian, Filipino, and Hmong. In addition, the percentage of male students (50.5%) was slightly larger than that of female students (49.5%).

Table IV-1

*Demographic Composition of Ninth Graders by Race or ethnicity, Gender, and SES*

| Identity | Percent (%) |
|---|---|
| Race or ethnicity | |
| White, non-Hispanic | 51.6 |
| Black, non-Hispanic | 13.6 |
| Hispanic | 21.9 |
| Southeast Asian | 2.2 |
| Other Asian/Pacific Islander | 3.8 |
| American Indian/Alaska Native | 0.7 |
| More than one race | 6.2 |
| Gender | |
| Male | 50.5 |
| Female | 49.5 |
| Total | 100.0 |

**Univariate Analysis**

Tables IV-2-1 through IV-2-2 compare means of variables used in this study (educational outcomes and schooling experience) based on different combinations of race or ethnicity, gender, and SES. Similar to other studies using intersectionality as an analytical tool (e.g., Anthias, 2012; Woodhams, Lupton, & Cowling, 2015), these tables compare means of variables across diverse groups controlling for one factor among three identities (e.g., average math scores of Southeast Asian male students versus those of Southeast Asian female students within the lowest two-fifths SES by controlling for SES).

**Math Achievement**

As expected, SES matters consistently in math achievement for all race or ethnicity groups regardless of gender: student groups from higher SES showed higher means of math achievement (see Table IV-2-1). For example, Southeast Asian female students from the highest quintile SES ($M$ = 58.85, $SD$ = 8.13) show higher math achievement scores than those of Southeast Asian female students from the middle two quintiles ($M$ = 54.94, $SD$ = 9.17) and bottom two quintiles SES ($M$ = 51.71, $SD$ = 9.62). The means of math achievement scores among Asian students were consistently higher than those of other race or ethnicity groups across SES, regardless of gender. The role of race or ethnicity, particularly for American Indian/Alaska Native students, is mediated by SES. For example, the means of American Indian/Alaska Natives with low SES (bottom four quintiles) were the lowest among race or ethnicity groups regardless of gender. The means of American Indian/Alaska Natives with the highest quintile SES were higher than those of black and Hispanic students regardless of gender. Finally, the role of gender is mediated both by SES and race or ethnicity. For example, the means of math achievement

among Southeast Asian female students in the bottom two quintiles SES were higher than those of male counterparts with similar SES. However, this pattern was the reverse for Southeast Asian students from the middle two quintiles SES.

**Intention to Enter Higher Education**

Table IV-2-1 shows that a higher SES is associated with the intention to enter higher education for all race or ethnicity groups, except Southeast Asian students. For example, the intent to pursue higher education among Southeast Asian female students from the highest quintile SES ($M$ = .50, $SD$ = .50) is not higher than Southeast Asian female students from the lowest two quintiles SES ($M$ = .51, $SD$ = .50). In addition, the intent to enter higher education among Southeast Asian female students from the middle two quintiles SES is the lowest ($M$ = .45, $SD$ = .50) compared to the two other SES groups.

The roles of gender and race or ethnicity do not have a consistent pattern related to students' intent to enter higher education. In the bottom two quintiles SES, 51% of Southeast Asian females plan to enter college, which is higher than the percentage for their Southeast Asian male counterparts from similar SES (46%). However, in the middle two quintiles and the highest quintile SES, Southeast Asian females' intent to enter higher education (45%, 50%, respectively) was lower than that of their male counterparts (64%, 63%, respectively).

Table IV-2-1

*Comparisons of Group Means for Educational Outcomes* (weighted $N = 3{,}938{,}044$)

| Identity | | Lowest two quintiles SES | | Middle two quintiles SES | | Highest quintile SES | |
|---|---|---|---|---|---|---|---|
| | | Math Score | Intention to enter higher education (%) | Math Score | Intention to enter higher education (%) | Math Score | Intention to enter higher education (%) |
| Male | American Indian/Alaska Native | 39.08 | .20 | 42.79 | .34 | 56.99 | .77 |
| | | (8.48) | (.40) | (7.97) | (.47) | (7.70) | (.42) |
| | Black | 41.90 | .46 | 46.51 | .61 | 49.51 | .81 |
| | | (9.77) | (.50) | (8.59) | (49) | (8.93) | (.39) |
| | Hispanic | 45.91 | .41 | 49.99 | .52 | 55.87 | .52 |
| | | (9.41) | (.49) | (8.86) | (.50) | (8.23) | (.50) |
| | White | 46.43 | .40 | 51.46 | .54 | 57.08 | .76 |
| | | (9.87) | (.49) | (9.03) | (.50) | (9.23) | (.43) |
| | Other Asian/Pacific Islander | 47.98 | .33 | 55.40 | .58 | 63.19 | .77 |
| | | (11.43) | (.47) | (8.90) | (.49) | (8.75) | (.42) |
| | Southeast Asian | 48.68 | .46 | 55.56 | .64 | 57.43 | .63 |
| | | (9.45) | (.50) | (9.30) | (.48) | (9.02) | (.48) |
| Female | American Indian/Alaska Native | 38.94 | .27 | 44.88 | .54 | 57.08 | .90 |
| | | (9.97) | (.45) | (9.05) | (.50) | (9.50) | (.30) |
| | Black | 43.43 | .53 | 47.35 | .64 | 53.62 | .93 |
| | | (8.00) | (.50) | (8.57) | (.48) | (8.55) | (.25) |
| | Hispanic | 46.08 | .43 | 50.61 | .58 | 54.66 | .80 |
| | | (8.40) | (.49) | (8.44) | (.49) | (9.73) | (.40) |
| | White | 47.35 | .49 | 51.78 | .64 | 56.42 | .77 |
| | | (8.71) | (.50) | (8.55) | (.48) | (8.48) | (.42) |
| | Other Asian/Pacific Islander | 48.98 | .55 | 54.01 | .68 | 62.37 | .84 |
| | | (10.67) | (.50) | (9.09) | (.47) | (9.13) | (.36) |
| | Southeast Asian | 51.71 | .51 | 54.94 | .45 | 58.85 | .50 |
| | | (9.62) | (.50) | (9.17) | (.50) | (8.13) | (.50) |

*Note*. Standard deviations are in parentheses.

**Gender Stereotypes about Males' Superior Math Abilities**

Across all race or ethnicity except American Indian/Alaska Natives and across all SES groups, male students are more likely to believe that males are better than females in math than female students. Focusing on race or ethnicity, both male and female Southeast Asian students are less likely than other racial or ethnic groups to believe that males are better than females in math. Furthermore, the role of SES in gender stereotypes is mediated by both race or ethnicity and gender.

**Quality of Interactions with Math Teachers**

Among black students and Other Asian/Pacific Islander students, the perceived qualities of interactions with math teachers are better for females than that of males regardless of their SES. This finding does not hold true for Southeast Asian females. That is, the role of SES in the perception of interactions with math teachers is mediated by both race or ethnicity and gender, particularly for Southeast Asian students.

**Teacher Quality**

The positive associations between SES and the two measures of teacher quality (i.e., teaching experience, graduate degree) for black and white students across gender and all SES groups are noticeable. Indeed, compared to other race or ethnicity groups, all teacher quality measures of white and black students from the highest quintile SES are strikingly higher than those of white and black students from the lower two quintiles SES, on average. However, the role of SES does not have a consistent pattern related to teacher quality measures for Southeast Asian girls Finally, the role of gender and race or ethnicity does not have a consistent pattern related to teacher quality measures.

Table IV-2-2

*Comparisons of Group Means for Schooling Experience* (weighted $N = 3{,}938{,}044$)

| Identity | | Lowest two quintiles SES | | | Middle two quintiles SES | | | Highest quintile SES | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Gender stereotypes in math (%) | Quality of interactions with math teacher | Math teacher experience (years) | Gender stereotypes in math (%) | Quality of interactions with math teacher | Math teacher experience (years) | Gender stereotypes in math (%) | Quality of interactions with math teacher | Math teacher experience (years) |
| Male | American Indian/Alaska Native | .05 | 1.98 | 9.57 | .10 | 1.97 | 6.77 | .28 | 2.57 | 10.17 |
| | | (.21) | (.63) | (8.15) | (.30) | (.55) | (8.49) | (.45) | (.47) | (6.14) |
| | Black | .25 | 2.13 | 7.80 | .25 | 2.22 | 8.98 | .34 | 2.15 | 10.47 |
| | | (.43) | (.83) | (7.18) | (.43) | (.68) | (8.32) | (.47) | (.67) | (9.78) |
| | Hispanic | .21 | 2.24 | 8.68 | .24 | 2.27 | 8.40 | .26 | 2.26 | 10.63 |
| | | (.41) | (.59) | (7.58) | (.43) | (.61) | (8.00) | (.44) | (.51) | (8.79) |
| | White | .21 | 2.20 | 9.06 | .22 | 2.24 | 9.99 | .27 | 2.29 | 10.84 |
| | | (.41) | (.66) | (8.04) | (.42) | (.62) | (8.52) | (.45) | (.61) | (9.16) |
| | Other Asian/Pacific Islander | .31 | 2.17 | 8.07 | .27 | 2.19 | 9.02 | .30 | 2.34 | 11.05 |
| | | (.46) | (.51) | (6.73) | (.44) | (.70) | (8.04) | (.46) | (.63) | (9.96) |
| | Southeast Asian | .17 | 2.27 | 8.14 | .13 | 2.42 | 10.34 | .18 | 2.43 | 9.21 |
| | | (.38) | (.50) | (6.09) | (.34) | (.53) | (8.28) | (.38) | (.57) | (6.89) |
| Female | American Indian/Alaska Native | .10 | 2.29 | 3.87 | .34 | 2.20 | 8.57 | .00 | 2.36 | 5.64 |
| | | (.30) | (.50) | (6.33) | (.47) | (.57) | (9.30) | (.00) | (.49) | (7.21) |
| | Black | .12 | 2.32 | 7.94 | .17 | 2.33 | 9.92 | .14 | 2.22 | 11.39 |
| | | (.37) | (.53) | (7.43) | (.37) | (.57) | (9.18) | (.34) | (.70) | (9.37) |
| | Hispanic | .14 | 2.16 | 8.21 | .14 | 2.19 | 10.30 | .13 | 2.27 | 10.44 |
| | | (.35) | (.63) | (6.98) | (.35) | (.65) | (8.03) | (.33) | (.60) | (8.65) |
| | White | .15 | 2.21 | 9.60 | .15 | 2.25 | 10.59 | .17 | 2.27 | 11.48 |
| | | (.36) | (.61) | (8.81) | (.36) | (.60) | (8.86) | (.38) | (.60) | (9.07) |
| | Other Asian/Pacific Islander | .10 | 2.28 | 10.40 | .19 | 2.31 | 11.23 | .19 | 2.49 | 10.21 |
| | | (.30) | (.54) | (7.30) | (.39) | (.57) | (8.70) | (.39) | (.55) | (8.00) |
| | Southeast Asian | .03 | 2.44 | 10.38 | .12 | 2.29 | 9.89 | .04 | 2.41 | 10.03 |
| | | (.16) | (.54) | (7.72) | (.33) | (.54) | (6.81) | (.19) | (.62) | (9.05) |

Table IV-2-2 (continued)

| Identity | | Lowest two quintiles SES | Middle two quintiles SES | Highest quintile SES |
|---|---|---|---|---|
| | | Math teacher graduate degree (%) | Math teacher graduate degree (%) | Math teacher graduate degree (%) |
| Male | American Indian/Alaska Native | .66 | .62 | .39 |
| | | (.47) | (.49) | (.49) |
| | Black | .43 | .44 | .50 |
| | | (.50) | (.50) | (.50) |
| | Hispanic | .43 | .42 | .51 |
| | | (.50) | (.49) | (.50) |
| | White | .45 | .47 | .51 |
| | | (.50) | (.50) | (.50) |
| | Other Asian/Pacific Islander | .43 | .46 | .58 |
| | | (.50) | (.50) | (.49) |
| | Southeast Asian | .60 | .44 | .58 |
| | | (.49) | (.50) | (.49) |
| Female | American Indian/Alaska Native | .85 | .57 | .60 |
| | | (.36) | (.50) | (.49) |
| | Black | .39 | .37 | .55 |
| | | (.49) | (.48) | (.50) |
| | Hispanic | .51 | .52 | .54 |
| | | (.50) | (.50) | (.50) |
| | White | .44 | .48 | .56 |
| | | (.50) | (.50) | (.50) |
| | Other Asian/Pacific Islander | .55 | .55 | .72 |
| | | (.50) | (.50) | (.45) |
| | Southeast Asian | .55 | .62 | .67 |
| | | (.50) | (.49) | (.47) |

*Note*. Standard deviations are in the parentheses.

## Bivariate Analysis

Table IV-3 reports a bivariate correlation matrix of variables. Ninth graders' math achievement scores show positively significant moderate correlations with their intention to enter higher education ($r$ = .30) and SES ($r$ = .43) and negatively significant correlation with percentage of FRL students in a school ($r$ = -.32). Students' SES is positively correlated with their intention to pursue higher education ($r$ = .25). Gender stereotypes about males' superior math abilities shows a significant negative correlation with female students ($r$ = -.11). Although math teachers' years of teaching experience is positively correlated with their students' SES ($r$ = .11), it is negatively correlated with percentages of students of color ($r$ = -.12) and FRL students ($r$ = -.12) in the school in which the teachers work. This indicates that math teachers with more years of teaching experience tend to be in schools with higher SES students and less likely to be in schools with higher percentages of non-white students and poor students. In addition, students' SES shows significant negative correlations with the percentages of students of color ($r$ = -.24) and FRL students ($r$ = -.44). The measure of school climate is also negatively associated with the percentages of students of color ($r$ = -.07) and FRL students ($r$ = -.18). The percentage of FRL students in a school is moderately and positively associated with the percentage of students of color in a school ($r$ = .55).

These descriptive statistics illustrate broad statuses of students' educational outcomes and experiences based on the convergence of race or ethnicity, gender, and SES. Still, it will not provide information on intersectionality of three identities simultaneously based on these descriptive statistics, which requires more rigorous statistical analysis for research questions (1), (2), and (3).

Table IV-3

*Bivariate Correlation Matrix for Variables* (weighted $N = 3{,}938{,}044$)

| Variables | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. Math score | 50 (10) | | | | | | | | | | | | |
| 2. Intention to enter higher education | .30** | .57 (.49) | | | | | | | | | | | |
| 3. Gender-based stereotype in math | .04** | .04** | .19 (.39) | | | | | | | | | | |
| 4. Quality of interactions with math teachers | .11** | .09** | -.00 | 2.24 (.62) | | | | | | | | | |
| 5. Years of math teacher's teaching experience | .12** | .06** | .01 | -.02** | 9.71 (8.43) | | | | | | | | |
| 6. Math teacher's graduate degree | .08** | .04** | -.01 | -.01 | .16** | .48 (.50) | | | | | | | |
| 7. Socioeconomic status | .43** | .25** | .04** | .04** | .11** | .07** | -.08 (.75) | | | | | | |
| 8. Gender (female) | .01 | .06** | -.11** | .02 | .03** | .03** | .00 | .50 (.50) | | | | | |
| 9. Southeast Asian | .07** | -.01** | -.03** | .03** | .00 | .03** | .02** | -.01 | .02 (.15) | | | | |
| 10. Urban schools | -.02* | .00 | .00 | -.01* | -.01 | .03** | -.07** | .02** | .07** | .32 (.47) | | | |
| 11. % of student of color | -.15** | -.04** | .00 | -.03** | -.12** | .01 | -.24** | .01 | .11** | .41** | 6.15 (3.13) | | |
| 12. % of FRL students | -.32** | -.14** | -.02** | -.04** | -.12** | -.07** | -.44** | -.01 | .01 | .21** | .55** | 39.29 (25.15) | |
| 13. School climate | .11** | .08** | .02 | .03** | .01 | .03** | .15** | .03** | -.03** | -.04** | -.07** | -.18** | 2.21 (.24) |

*Note*. Means and standard deviations are presented on the diagonal. $^{*}p < .05$, $^{**}p < .01$

## Multivariate Analysis

**Research Question 1: How is the convergence (i.e., intersectionality) of race or ethnicity, gender, and SES associated with the schooling experience of Southeast Asian female students?**

Research question (1) examines the patterns of educational experiences related to students' multiple identities (i.e., gender stereotypes about males' superior math abilities, exposure to high-quality teachers, and quality of individual interactions with their teachers). In order to identify patterns of educational inequity in educational experiences arising from multiple identities as well as convergences of these identities, this study used two different statistical models: (1) predicting variables of educational experiences with three identities as predictors and (2) predicting variables of educational experiences with three identities and 16 interaction variables.

**Intersectionality and gender stereotypes about differences in abilities.** Table IV-4 shows the results of the logistic regression using a binary dependent variable of a student's gender stereotypes about males' superior math abilities as predicted by students' multiple identities. Model 1 uses seven independent variables related to students' race or ethnicity, gender, and SES to examine the relationship between the likelihood that a student has a gender stereotypes about males' superior math abilities and his or her race or ethnicity, gender, and SES. By extension, Model 2 included 16 interaction terms to test the research hypothesis regarding if the intersectionality of students' three identities is related to students' gender stereotypes. In Model 2, none of the interactions was statistically significant, indicating that no relationship exists between the intersectionality of the three identities and gender stereotypes about males' superior math abilities.

Table IV-4

*Logistic Regression Analysis of Students' Gender Stereotypes Predicted by their Multiple Identities* (weighted $N$ = 3,938,044)

| Predictor | Model 1 | | Model 2† | |
|---|---|---|---|---|
| | $\beta$ | $e^{\beta}$ (odds ratio) | $\beta$ | $e^{\beta}$ (odds ratio) |
| Socioeconomic status (SES) | 0.13*** | 1.14 | 0.18*** | 1.19 |
| | (0.03) | | (0.06) | |
| Female | -0.56*** | 0.57 | -0.50*** | 0.61 |
| | (0.06) | | (0.07) | |
| Race or ethnicity | | | | |
| American Indian/Alaska Native | -0.46 | 0.63 | -0.98* | 0.37 |
| | (0.31) | | (0.47) | |
| Black | 0.07 | 1.07 | 0.16 | 1.17 |
| | (0.10) | | (0.11) | |
| Hispanic | -0.02 | 0.98 | -0.02 | 0.98 |
| | (0.08) | | (0.13) | |
| Other Asian/Pacific Islander | 0.19 | 1.21 | 0.34 | 1.40 |
| | (0.12) | | (0.20) | |
| Southeast Asian | -0.64** | 0.53 | -0.50** | 0.61 |
| | (0.12) | | (0.20) | |
| Intersectionality | | | | |
| (Intercept) | -1.18*** | NA | -1.22*** | NA |
| | (0.04) | | (0.04) | |
| Deviance (-2Loglikelihood) | 18566.2 | | 18532.1 | |
| AIC | 18582.2 | | 18580.2 | |
| BIC | 18645.2 | | 18769.1 | |

*Note.* (1) For all models, the reference group for race or ethnicity is white student and the reference group for female is male. (2) Standard errors are in the parentheses.

† The result of Model 2 reported only significant interaction terms among all 16 interaction terms. $^{*}p < .05$, $^{**}p < .01$, $^{***}p < .001$

Comparing overall model fits between Model 1 and Model 2, the values of deviance and AIC are smaller in Model 1. However, the value of BIC is higher in Model 2, because BIC penalized the number of interactions used in Model 2. Thus, this study concluded that Model 1 provides a better fit for the data than Model 2.

Based on Model 1 in Table IV-4, the prediction model including only significant terms is as follows:

Predicted logit of (Gender stereotypes about males' superior math abilities) = -1.18 + 0.13 × (SES) + (-0.56) × (Female) + (-0.64) × (Southeast Asian) (5)

In particular, the coefficient for *SES* in Model 1 ($\beta$ = 0.13) represents the change of the logit for every additional one-unit change of SES index score. The exponent of the coefficient for *SES* is 1.20, indicating the odds of having gender-based stereotype with a one-unit higher SES index score is 1.20 times the odds for a student with a one-unit lower SES index score. Similarly, the logistic regression coefficient for *Female* ($\beta$ = -0.56) indicates how much the logit is expected to change when the value for *Female* changes by one unit (i.e., when a student is a female compared to a male). The exponentiated regression coefficient of *Female*, exp(-0.56) = 0.57, indicates that the odds of having gender stereotypes about males' superior math abilities for a female are 0.57 times the odds for a male. In other words, females are less likely to have this gender stereotype about males' superior math abilities. Finally, the coefficient for *Southeast Asian* in Model 1 ($\beta$ = -0.64) represents the change of the logit for being a Southeast Asian. The exponent of the coefficient for Southeast Asian students is 0.53, indicating the odds of having gender-based stereotype with a Southeast Asian student are 0.53 times the odds for a white student. In other words, Southeast Asian students are less likely to have gender stereotypes about males' superior math abilities than white students.

Based on Equation (5), Table IV-5 shows the logits, the exponentiations, and the probabilities of gender stereotypes of different student groups when a student's

SES score is zero[1]. For example, for Southeast Asian female students with an SES index that is zero (*Southeast Asian* = 1, *Female* = 1, *SES* = 0), the predicted logit of their gender stereotypes about males' superior math abilities is -1.18 + 0.13 × (0) + (-0.56) × (1) + (-0.64) × (1) = -2.38. Based on the exponentiated value of the predicted logit, exp(-2.38) = 0.09, the value of probability[2] (0.085) indicates the expected probability of having gender stereotypes for Southeast Asian female students with an SES index score of zero. As no significant interaction term exists for the convergences of identities, the predicted logits, exponentiations, and probabilities of having gender stereotypes in math for white, Other Asian/Pacific Islander, black, and Hispanic were the same among both males and females based on Equation (5).

Table IV-5

*Logits, Exponentiations, and Probabilities of Having Gender Stereotypes in Math among Different Student Groups*

| Gender | Race or ethnicity | SES | Logit | Exp(Logit) | Probability |
|---|---|---|---|---|---|
| Male | White, Other Asian/Pacific Islander, Black, Hispanic, American Indian/Alaska Native | 0 | -1.180 | 0.307 | 0.235 |
| Female | White, Other Asian/Pacific Islander, Black, Hispanic, American Indian/Alaska Native | 0 | -1.740 | 0.176 | 0.149 |
| Male | Southeast Asian | 0 | -1.820 | 0.162 | 0.139 |
| Female | Southeast Asian | 0 | -2.380 | 0.093 | 0.085 |

[1] This indicates approximately average SES indicating average levels of education of each parent or guardian or of the single parent/guardian; the occupational prestige score of each parent or guardian or of the single parent/guardian; and family income.

[2] $\pi\ (Probability) = \frac{e^{logit}}{1+e^{logit}}$

Table IV-5 demonstrates that controlling for SES index scores, males who are whites, Other Asian/Pacific Islanders, blacks, Hispanics, and American Indian/Alaska Natives are the most likely to have gender stereotypes about males' superior math abilities. The expected probability for gender stereotypes of Southeast Asian female students (0.085) was lower than those of other race or ethnicity females as well as Southeast Asian male students (0.139).

**Intersectionality and exposure to high-quality teachers.** This study examines the relationships between the intersectionality of race or ethnicity, gender, and SES and two teacher quality measures that the extant literature has explored previously: (1) years a math teacher has taught high school math and (2) whether or not teacher earned a graduate degree.

***Teaching experience.*** As noted, this study used two different statistical models for predicting years of math teachers' teaching experience (see Table IV-6): (1) predicting years of teaching with three identities as predictors (Model 3) and (2) predicting years of teaching with three identities and 16 interaction variables (Model 4). After comparing both models, Model 3 was selected for this study to explain years of math teachers' teaching experience for three reasons: (1) although the value of deviance is smaller in Model 4, the values of AIC and BIC are higher in Model 4; (2) none of the 16 interaction variables in Model 4 was statistically significant; and (3) considering the previous two reasons, the more parsimonious statistical model with fewer predictors (Model 3) is better.

Table IV-6

*Results of Fitting Regression Models Predicting Math Teachers' Years of Teaching Experiences* (weighted $N$ = 3,938,044)

| | Model 3 | Model 4† |
|---|---|---|
| Socioeconomic status (SES) | 1.04*** | 0.89** |
| | (0.18) | (0.27) |
| Female | 0.50* | 0.59* |
| | (0.21) | (0.25) |
| Race or ethnicity | | |
| American Indian/Alaska Native | -2.51 | -1.82 |
| | (1.87) | (1.85) |
| Black | -1.00* | -0.97 |
| | (0.50) | (0.67) |
| Hispanic | -0.76* | -0.63 |
| | (0.38) | (0.54) |
| Other Asian/Pacific Islander | -0.26 | -0.66 |
| | (0.58) | (0.80) |
| Southeast Asian | -0.33 | -0.43 |
| | (0.79) | (1.08) |
| Intersectionality | | |
| (Intercept) | 9.87*** | 9.84*** |
| | (0.30) | (0.33) |
| Deviance (-2Loglikelihood) | 107171.2 | 107136.4 |
| AIC | 107179.2 | 107186.4 |
| BIC | 107219.2 | 107377.1 |

*Note*. (1) For all models, the reference group for race or ethnicity is white student and the reference group for female is male. (2) Standard errors are in the parentheses. † The results of Model 4 show no significant interaction among all 16 interaction terms. $^{*}p < .05$, $^{**}p < .01$, $^{***}p < .001$

Based on Model 3 and as shown in Table IV-6, no statistically significant relationship exists between the intersectionality of students' race or ethnicity, gender, and SES and their math teachers' years of teaching. In other words, the years of teaching experience of Southeast Asian students' math teachers were not significantly different from those of their white counterparts. Focusing on SES, a

student who has a one-unit higher SES index score is, on average, taught by a math teacher who has one more year of teaching experience regardless of the student's race or ethnicity and gender. Furthermore, a female ninth-grader is, on average, taught by a math teacher who has six months more of teaching experience than her male counterpart. Finally, a math teacher of a black and Hispanic student is likely to have fewer years of teaching ($\beta$ = -1.00 and $\beta$ = -0.76, respectively) than that of a white student, on average. In other words, each factor of race or ethnicity, gender, and SES matters for math teachers' years of teaching, and further intersectionalities among three identities were not associated with math teachers' years of teaching experience.

***Graduate degree.*** Table IV-7 shows the results of logistic regression examining the likelihood that a math teacher has a graduate degree based on the multiple identities of students. Model 5 includes only three identities while Model 6 includes three identities and interactions among them. Comparing overall model fits between Model 5 and Model 6 leads to the conclusion that Model 6 provides a better fit for explaining the relationship between likelihood that a math teacher has a graduate degree and students' multiple identities.

In Model 6, the odds of a math teacher having a graduate degree for a Southeast Asian female student was not statistically different from that of their white counterparts. A student from a higher SES background is more likely to have a math teacher with a graduate degree than a student from a lower SES background. In particular, the exponent of the coefficient for *SES* is 1.17, indicating the odds of a math teacher having a graduate degree for a student with a one-unit higher SES index score is 1.17 times the odds for a student with a one-unit lower SES index score. The pattern that higher SES students are more likely to have a math teacher with a

graduate degree also applies to Southeast Asian female students.

Table IV-7

*Result of Logistic Regression Analysis for Math Teachers' Graduate Degree Predicted by their Multiple Identities* (weighted $N$ = 3,938,044)

| Predictor | Model 5 | | Model 6† | |
|---|---|---|---|---|
| | $\beta$ | $e^{\beta}$ (odds ratio) | $\beta$ | $e^{\beta}$ (odds ratio) |
| Socioeconomic status (SES) | 0.18*** | 1.20 | 0.15* | 1.17 |
| | (0.05) | | (0.06) | |
| Female | 0.13* | 1.13 | 0.06 | 1.06 |
| | (0.05) | | (0.05) | |
| Race or ethnicity | | | | |
| American Indian/Alaska Native | 0.89 | 2.42 | 0.47 | 1.60 |
| | (0.63) | | (0.54) | |
| Black | -0.18 | 0.84 | -0.07 | 0.93 |
| | (0.12) | | (0.14) | |
| Hispanic | 0.08 | 1.08 | -0.13 | 0.88 |
| | (0.11) | | (0.13) | |
| Other Asian/Pacific Islander | 0.28* | 1.32 | 0.05 | 1.05 |
| | (0.12) | | (0.16) | |
| Southeast Asian | 0.34 | 1.40 | 0.22 | 1.24 |
| | (0.22) | | (0.26) | |
| Intersectionality | | | | |
| Hispanic × Female | | | 0.34* | 1.40 |
| | | | (0.15) | |
| (Intercept) | -0.15* | NA | -0.13 | NA |
| | (0.07) | | (0.07) | |
| Deviance (-2Loglikelihood) | 20885.7 | | 20837.2 | |
| AIC | 20901.7 | | 20885.2 | |
| BIC | 20962.7 | | 20962.2 | |

*Note*. (1) For all models, the reference group for race or ethnicity is white student and the reference group for female is male. (2) Standard errors are in the parentheses.

† The results of Model 6 report only significant interaction terms among all 16 interaction terms. * $p < .05$, ** $p < .01$, *** $p < .001$

One interaction term between Hispanic and Female in Model 6 was statistically significant. The coefficient of the interaction between Hispanic and

Female ($\beta$ = 0.34) indicates either the modification of the effect of being female by being Hispanic or vice versa. In particular, the exponentiated regression coefficient of the interaction between Hispanic and Female, exp(0.34) = 1.40, indicates the odds of being taught by a math teacher with a graduate degree for a Hispanic female student is 1.40 times the odds for the other three groups (Hispanic males, males who are not Hispanic, and females who are not Hispanic).

**Intersectionality and quality of individual interactions with their teachers.** Table IV-8 reports the results of multiple regression analyses to explore individual students' interactions with their math teachers based on (1) Model 7 using only three identities and (2) Model 8 using three identities and 16 interaction variables. Comparing overall model fits between Model 7 and Model 8 leads to the conclusion that Model 8 provides a better fit for explaining the relationship between quality of interactions with math teachers and students' multiple identities.

Based on Model 8, a composite of scores related to interactions with math teachers (i.e., teacher's expectations, teacher's treatment in terms of respect, and teacher's fairness) revealed that Southeast Asian students perceive a higher degree of interactions than do their white counterparts ($\beta$ = 0.15). In addition, the higher SES index score is positively associated with higher individual interactions with their teachers ($\beta$ = 0.05). The interaction term focusing on Southeast Asian female students (i.e., Southeast Asian × Female) was not statistically significant, indicating that individual interactions of Southeast Asian female students were not statistically different from three other student groups (i.e., Southeast Asian males, non-Southeast Asian females, and non-Southeast Asian males).

Table IV-8

*Results of Fitting Regression Models Predicting Quality of Individual Interactions with their Teachers* (weighted $N = 3{,}938{,}044$)

| | Model 7 | Model 8† |
|---|---|---|
| Socioeconomic status (SES) | 0.03** | 0.05** |
| | (0.01) | (0.02) |
| Female | 0.01 | 0.01 |
| | (0.02) | (0.02) |
| Race or ethnicity | | |
| American Indian/Alaska Native | -0.07 | -0.10 |
| | (0.07) | (0.11) |
| Black | 0.02 | -0.05 |
| | (0.03) | (0.04) |
| Hispanic | -0.01 | 0.00 |
| | (0.03) | (0.03) |
| Other Asian/Pacific Islander | 0.06 | -0.01 |
| | (0.04) | (0.05) |
| Southeast Asian | 0.14** | 0.15** |
| | (0.05) | (0.05) |
| Intersectionality | | |
| Black × Female | | 0.11* |
| | | (0.05) |
| Hispanic × SES | | -0.08* |
| | | (0.04) |
| (Intercept) | 2.23*** | 2.23*** |
| | (0.02) | (0.02) |
| Deviance (-2Loglikelihood) | 32404.3 | 32339.4 |
| AIC | 32422.3 | 32389.4 |
| BIC | 32492.2 | 32483.7 |

*Note.* (1) For all models, the reference group for race or ethnicity is white student and the reference group for female is male. (2) Standard errors are in the parentheses.

† The results of Model 8 report only significant interaction terms among all 16 interaction terms. $^{*}p < .05$, $^{**}p < .01$, $^{***}p < .001$

**Research Question 2: How is the convergence (i.e., intersectionality) of race or ethnicity, gender, and SES associated with the educational outcomes of Southeast Asian female students?**

Research question (2) examines the patterns of educational outcomes in relation to different convergences of three identities. This research question seeks to identify distinct patterns of educational inequity in student achievement coming from multiple challenges based on students' different identities. In particular, this study included 16 interaction variables in regression models for the different convergences of the three students' identities that this study explores (race or ethnicity, gender, and SES). Using 16 statistical interaction terms promotes the examination of core premises of intersectionality (i.e., simultaneity and multiplicity) as well as the explanation of the patterns of intersectionality in educational outcomes in a simpler way by testing whether the means of student subgroups differ statistically compared to the results from descriptive tables.

**Intersectionality and students' mathematics achievement.** Table IV-9 presents the results of the multiple regression analyses of ninth-grade students' mathematics achievement scores. Model 9 indicates that students' SES and race or ethnicity are significantly associated with students' math achievement. The higher the SES index scores, the higher scores the students achieved on average. In addition, although black and American Indian/Alaska Native students showed lower math scores than white students, both Southeast Asian and Other Asian/Pacific Islander students showed higher math scores than their white counterparts, on average. Finally, no significant gender gap emerged in mathematics achievement scores.

Table IV-9

*Results of Fitting Regression Models Predicting Mathematics Achievement*

(weighted $N$ = 3,938,044)

| | Model 9 | Model 10† |
|---|---|---|
| Socioeconomic status (SES) | 5.26*** | 5.86*** |
| | (0.13) | (0.23) |
| Female | 0.37 | 0.36 |
| | (0.21) | (0.24) |
| Race or ethnicity | | |
| American Indian/Alaska Native | -6.39*** | -5.46*** |
| | (1.55) | (1.42) |
| Black | -4.21*** | -5.02*** |
| | (0.41) | (0.56) |
| Hispanic | -0.48 | -0.63 |
| | (0.28) | (0.41) |
| Other Asian/Pacific Islander | 3.69*** | 3.64*** |
| | (0.59) | (0.96) |
| Southeast Asian | 3.30*** | 3.25*** |
| | (0.53) | (0.70) |
| Intersectionality | | |
| SES × Female | | -0.63* |
| | | (0.29) |
| SES × Black | | -1.33** |
| | | (0.52) |
| SES × Hispanic | | -1.18* |
| | | (0.56) |
| (Intercept) | 50.81*** | 50.77*** |
| | (0.19) | (0.22) |
| Deviance (-2Loglikelihood) | 925839.1 | 144337.8 |
| AIC | 925921.1 | 144387.8 |
| BIC | 926246.3 | 144585.5 |

*Note.* (1) For all models, the reference group for race or ethnicity is white student and the reference group for female is male. (2) Standard errors are in the parentheses.

† The results of Model 10 report only significant interaction terms among all 16 interaction terms. * $p < .05$, ** $p < .01$, *** $p < .001$

Comparing overall model fits between Model 9 and Model 10 leads to the conclusion that Model 10 provides a better fit for explaining the relationship between

math achievement scores and students' multiple identities. Rather than examining the effect of a single student identity, Model 10 attempts to identify the intersectionality of multiple identities. Among 16 interaction terms indicating different intersectionality based on students' multiple identities, three interaction variables related to SES were significantly associated with students' mathematics achievement scores: *SES* × *Female* ($\beta$ = -0.63), *SES* × *Hispanic* ($\beta$ = -1.18), and *SES* × *Black* ($\beta$ = -1.33).

Math achievement scores of Southeast Asian students were significantly higher than those of white students ($\beta$ = 3.25) and other race or ethnicity groups, except Other Asian/Pacific Islanders, regardless of gender. Furthermore, the association between SES and Southeast Asian students' math achievement scores ($\beta$ = 5.86) was not statistically different from those of white, American Indian/Native American, and Other Asian/Pacific Islander students. However, the statistically significant interaction between *SES* and *Female* ($\beta$ = -0.63) indicates that gender moderates the impact of SES on Southeast Asian female students' mathematics achievement compared to their male counterparts. In particular, the impact of SES on Southeast Asian female students' mathematics achievement is smaller than the average impact of SES on Southeast Asian male students' mathematics achievement. This gender difference in the association between SES and math achievement scores among Southeast Asian students, which indicates that SES matters less for females than for their male counterparts, also holds true for other race or ethnic groups. However, SES matters less for the achievement of black ($\beta$ = -1.33) and Hispanic female students ($\beta$ = -1.18) than it does for Southeast Asian female students. This finding indicates Southeast Asian female students' higher inequality across SES compared to their black and Hispanic counterparts.

The regression coefficients in Model 10 can be used to create the equations listed in Table IV-10 including only intercept (average score for each student group) and SES slope. Table IV-10 shows that Southeast Asian students' math achievement scores were higher than those of other race or ethnicity groups, except Other Asian/Pacific Islanders, regardless of gender. Furthermore, the association between SES and Southeast Asian males' math achievement was not significantly different from those of white, American Indian/Native American, and Other Asian/Pacific Islander males. The associations between SES and math achievement scores of these students (SES slopes = 5.86) were highest among all race or ethnicity groups, indicating higher inequality across SES.

Table IV-10

*Equations of Regression Lines for Different Student Groups based on Multiple Identities*

| Student group | Equation |
|---|---|
| White male | 50.77 + 5.86 × SES |
| White female | 50.77 + 5.23 × SES |
| Hispanic male | 50.77 + 4.68 × SES |
| Hispanic female | 50.77 + 4.05 × SES |
| Black male | 46.56 + 4.53 × SES |
| Black female | 46.56 + 3.90 × SES |
| American Indian/Alaska Native male | 45.31 + 5.86 × SES |
| American Indian/Alaska Native female | 45.31 + 5.23 × SES |
| Other Asian/Pacific Islander male | 54.41 + 5.86 × SES |
| Other Asian/Pacific Islander female | 54.41 + 5.23 × SES |
| Southeast Asian male | 54.02 + 5.86 × SES |
| Southeast Asian female | 54.02 + 5.23 × SES |

**Intersectionality and students' intention to enter higher education.** Table IV-11 reports results of logistic regression that uses a binary dependent variable of students' intention to enter higher education predicted by students' multiple identities. A seven- predictor main-effect logistic model (Model 11) was fitted to the data to examine the relationship between the likelihood that a student in ninth grade intends to enter higher education and his or her race or ethnicity, gender, and SES. By extension, Model 12 included 16 interaction terms among multiple identities.

Based on Model 11 shown in Table IV-11, the prediction model including only significant terms is as follows:

Predicted logit of (Intention to enter higher education) = -0.19 + 0.28 × (Female) + 0.25 × (Black) + (-0.63) × (American Indian/Alaska Native) + 0.73 × (SES) (6)

The logistic regression coefficient for *Female* ($\beta$ = 0.28) indicates how much the logit is expected to change when the value for *Female* changes by one unit (i.e., when a student is a female compared to a male). The exponentiated regression coefficient of *Female*, exp(0.28) = 1.32, indicates that the odds of intending to enter higher education for a female is 1.32 times the odds for a male. Similarly, the coefficient for *SES* in Model 11 ($\beta$ = 0.73) represents the change of the logit for every additional one-unit change of SES index score. In particular, the exponent of the coefficient for *SES* is 2.08, indicating the odds of intending to enter higher education for a student with a one-unit higher SES index score is 2.08 times the odds for a student with a one-unit lower SES index score.

Table IV-11

*Logistic Regression Analysis of Students' Intention to Enter Higher Education Predicted by their Multiple Identities* (weighted $N$ = 3,938,044)

| Predictor | Model 11 | | Model 12† | |
|---|---|---|---|---|
| | $\beta$ | $e^{\beta}$ (odds ratio) | $\beta$ | $e^{\beta}$ (odds ratio) |
| Socioeconomic status (SES) | 0.73*** | 2.08 | 0.85*** | 2.34 |
| | (0.03) | | (0.05) | |
| Female | 0.28*** | 1.32 | 0.34*** | 1.41 |
| | (0.04) | | (0.05) | |
| Race or ethnicity | | | | |
| American Indian/Alaska Native | -0.63* | 0.53 | -0.62* | 0.54 |
| | (0.25) | | (0.27) | |
| Black | 0.25** | 1.29 | 0.27** | 1.31 |
| | (0.10) | | (0.11) | |
| Hispanic | -0.07 | 0.93 | -0.16 | 0.85 |
| | (0.07) | | (0.11) | |
| Other Asian/Pacific Islander | 0.14 | 1.15 | -0.01 | 0.99 |
| | (0.10) | | (0.16) | |
| Southeast Asian | -0.18 | 0.84 | 0.22 | 1.24 |
| | (0.15) | | (0.15) | |
| Intersectionality | | | | |
| Southeast Asian × Female | | | -0.80*** | 0.45 |
| | | | (0.25) | |
| Hispanic × SES | | | -0.44** | 0.65 |
| | | | (0.17) | |
| Hispanic × SES × Female | | | 0.55** | 1.74 |
| | | | (0.19) | |
| (Intercept) | -0.19*** | NA | -0.15*** | NA |
| | (0.03) | | (0.04) | |
| Deviance (-2Loglikelihood) | 25940.0 | | 25858.3 | |
| AIC | 25996.0 | | 25906.3 | |
| BIC | 26019.2 | | 26006.1 | |

*Note.* (1) For all models, the reference group for race or ethnicity is white student and the reference group for female is male. (2) Standard errors are in the parentheses.

† The results of Model 12 report only significant interaction terms among all 16 interaction terms. $^{*}p < .05$, $^{**}p < .01$, $^{***}p < .001$

However, comparing overall model fits between Model 11 and Model 12 based on the AIC, BIC, and deviance concludes that Model 12 provides a better fit to explain the relationship between a student's intention to enter higher education and multiple identities, including the different intersectionality of multiple identities. Considering the multiple intersectionality of race or ethnicity, gender, and SES in Model 12, the interpretations become more complex. Based on Model 12 in Table IV-11, the prediction model including only significant terms is as follows:

Predicted logit of (Intention to enter higher education) = -0.15 + 0.34 × (Female) + 0.27 × (Black) + (-0.62) × (American Indian/Alaska Native) + 0.85 × (SES) + (-0.80) × (Southeast Asian) × (Female) + (-0.44) × (Hispanic) × (SES) + (0.55) × (Hispanic) × (SES) × (Female) (7)

In Model 12, three interaction terms were statistically significant: (1) the two-way interaction between *Southeast Asian* and *Female*, (2) the two-way interaction between *Hispanic* and *SES*, and (3) the three-way interaction among *Hispanic*, *SES*, and *Female*. Among these significant interactions, the coefficient of the interaction between *Southeast Asian* and *Female* is the difference between the log-odds ratio comparing Southeast Asians to non-Southeast Asians males and the log-odds ratio comparing Southeast Asians to non-Southeast Asians females. In other words, this coefficient is either the modification of the effect of being female by being Southeast Asian or the modification of the effect of being Southeast Asian by being female. In particular, the exponentiated regression coefficient of the interaction between *Southeast Asian* and *Female*, exp(-0.80) = 0.45, indicates that the odds of intending to enter higher education for a Southeast Asian female student is 0.45 times the odds for three other groups (Southeast Asian males, males who are not Southeast Asian, and females who are not Southeast Asian).

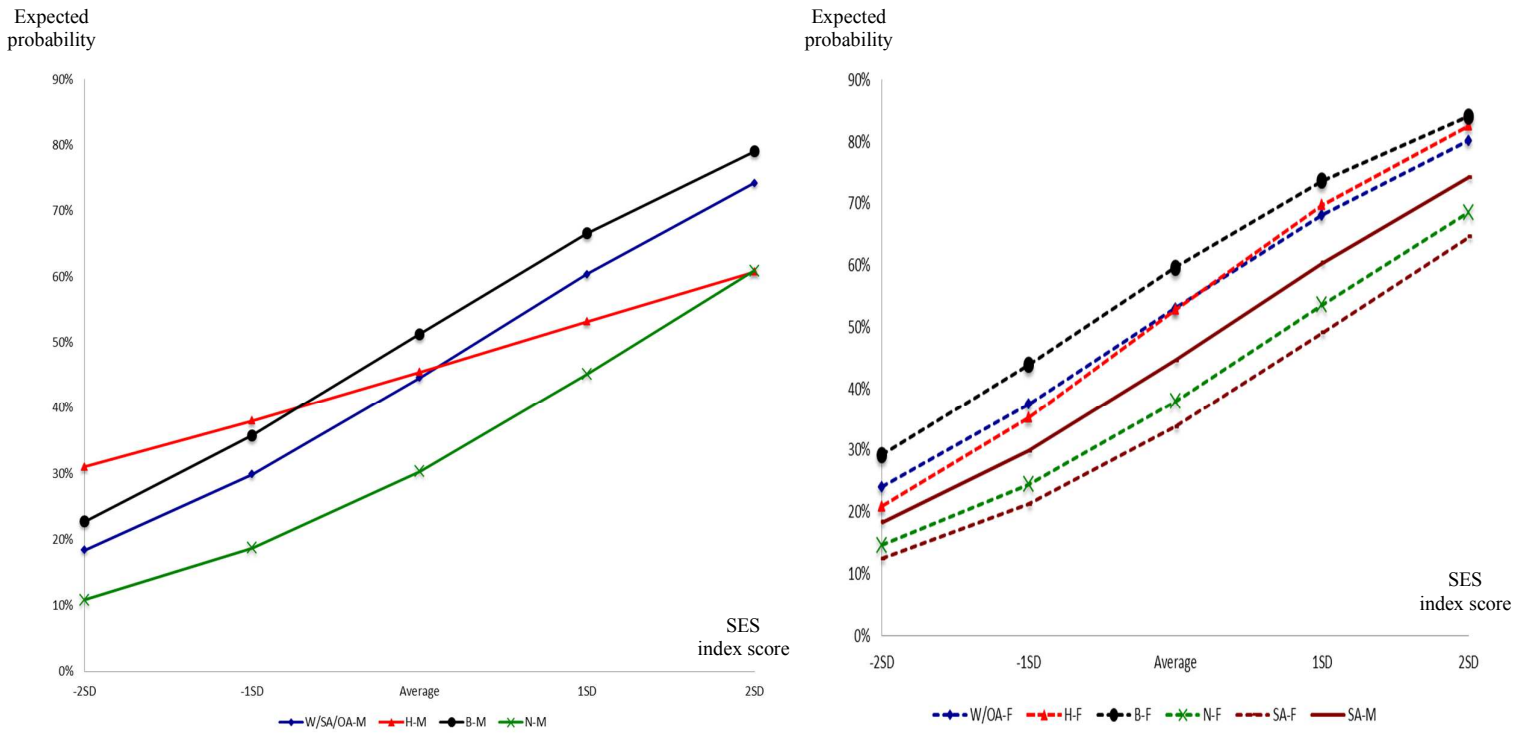
Based on Equation (7), Table IV-12 shows the logits, exponentiations, and probabilities of intending to enter higher education of different student groups when a student's SES score is zero. In particular, for Southeast Asian female students with an SES index as zero (*Southeast Asian* = 1, *Female* = 1, *SES* = 0), the exponentiated value of the predicted logit, exp(-0.608) = 0.544, represents that the odds of a Southeast female student with an SES index score of zero who intends to enter higher education were 0.544 times greater than the odds for a white male student with an SES index score of zero. The value of probability (0.533) indicates the expected probability of intending to enter higher education for Southeast Asian female students with an SES index score of zero. In other words, the probability of intending to enter higher education institutions for Southeast Asian females is .353; thus the probability of not intending to enter higher education is .647.

Using the same method of calculating probabilities for intending to enter higher education of different student groups, Figure IV-1 shows the differences amongst student groups based on five different SES index scores (+2SD, +1SD, average, -1SD, -2SD). The left panel of Figure IV-1 focuses on expected probabilities for males. Whites, Other Asian/Pacific Islanders, and Southeast Asian males show the same expected probabilities of intending to enter higher education based on Equation (7). The right panel of Figure IV-1 focuses on expected probabilities for females. In this figure, whites and Other Asian/Pacific Islander females show the same expected probabilities of intending to enter higher education based on Equation (7).

Table IV-12

*Logits, Exponentiations, and Probabilities of Intending to Enter Higher Education of Different Student Groups*

| Number | Female | Race or ethnicity | SES | Logit (P($Y$ = 1)) | Exp(Logit) | Probability |
|---|---|---|---|---|---|---|
| 1 | Male | White, Other Asian/Pacific Islander, Southeast Asian | 0 | -0.151 | 0.860 | 0.462 |
| 2 | Female | White, Other Asian/Pacific Islander | 0 | 0.191 | 1.210 | 0.548 |
| 3 | Male | Black | 0 | 0.117 | 1.124 | 0.529 |
| 4 | Female | Black | 0 | 0.459 | 1.582 | 0.613 |
| 5 | Male | Hispanic | 0 | -0.151 | 0.860 | 0.462 |
| 6 | Female | Hispanic | 0 | 0.191 | 1.210 | 0.548 |
| 7 | Male | American Indian/Alaska Native | 0 | -0.767 | 0.464 | 0.317 |
| 8 | Female | American Indian/Alaska Native | 0 | -0.425 | 0.654 | 0.395 |
| 9 | Female | Southeast Asian | 0 | -0.608 | 0.544 | 0.353 |




[Figure IV-1] Predicted Probability of Intending to Enter Higher Education Across SES Index Scores Based on Equation (7)

*Note*. The solid lines indicate male students, and the dotted lines indicate female students; the blue lines indicate white, brown lines indicate Hispanic, and black lines indicate black students. W: white, SA: Southeast Asian, OA: Other Asian/Pacific Islander, B: black, H: Hispanic, N: American Indian/Alaska Native, M: Male, F: Female.

From Figure IV-1, on average, the expected probability of the intention to pursue higher education of Southeast Asian female students was the lowest among females and lower than Southeast Asian males across all SES index scores. Compared to this finding of Southeast Asian students, the expected probability of a black student intending to enter higher education regardless of SES index scores is higher than that of Southeast Asian students as well as other races or ethnicities students for both males (left panel of Figure 1) and females (right panel of Figure 1).

Focusing on the association between SES and students' intention to enter higher education, the higher SES index scores show a student's greater expected probability to pursue higher education regardless of race or ethnicity and gender overall. The exponentiated regression coefficient of SES for Southeast Asian students, which was not statistically different from that of other race or ethnicity groups [$\exp(0.85) = 2.34$, $p < .001$], creates parallel lines across race or ethnicity groups according to different SES. This result indicates that the relative positions of students' intention to enter higher education based on different racial and ethnic groups are retained across SES. However, the significant interaction terms related to Hispanic students creates unique patterns in the intention to enter higher education of Hispanic students across different SES index scores.

**Research Question 3: How do associations among the intersectionality of race or ethnicity, gender, SES and student experiences differ across schooling context for students overall? Do these patterns differ for Southeast Asian female students?**

Research question (3) examines the relationship between the intersectionality of race or ethnicity, gender, and SES on students' educational outcomes and experiences and organizational characteristics. In order to analyze clustered or nested

data, when students are selected from the same school, this study used linear mixed effect models (LMM) including both random and fixed effects.

Among six dependent variables examined in this study (two educational outcomes and four educational experiences), this study calculated intra-class correlation coefficients (*ICC*s) showing the degree of dependence of observations (see Table IV-13). *ICC*s are typically used to check if LMM is necessary for modeling the nested data (Raudenbush & Bryk, 2002). A larger *ICC* indicates that more individual student variance in dependent variables are based on differences between schools. In other words, a larger *ICC* shows that differences are more about schooling contexts than individual students' experiences per se. In addition, organizational research often uses a standard for the *ICC* of greater than 0.10 to account for organizational differences (Vogt, 2011). An *ICC* less than 0.05 is typically too small to address the between-group variance (Vogt, Gardner, & Haeffele, 2012). Table IV-14 shows that the *ICC* of mathematics achievement score is 0.21, suggesting that 21% of the variance in math achievement scores occurs at the school level and 79% occurs at the individual level. Furthermore, the *ICC*s of math teachers' teaching experience and whether or not having a graduate degree were considerable—both above 0.40. These high *ICC*s indicate more than 40% of school differences occur in these teacher-related variables. However, the *ICC*s for a student's intention to pursue higher education, gender stereotypes about males' superior math abilities, and quality of individual interactions with their teachers show that less than 10% of school differences exist, indicating that more than 90% of the variances in these variables are at the individual student level. Considering the results of *ICC*s and the purpose of research question (3), this study explored the association between school characteristics and intersectionality, with only two

dependent variables showing moderate to large values of *ICC*s (i.e., over 0.10) and including any significant intersectionality in the previous regression analyses: mathematics achievement score and teacher's graduate degree.

Table IV-13

*Intra-class Correlations of Six Dependent Variables*

| Dependent variables | *ICC* |
|---|---|
| A student's mathematics achievement score | 0.21 |
| A student's intention to enter higher education | 0.04 |
| A student's gender stereotypes | 0.05 |
| A math teacher's teaching experience | 0.40 |
| A math teacher's graduate degree | 0.69 |
| A student's quality of individual interactions with his/her teachers | 0.08 |

**Intersectionality in math achievement and school characteristics**. Table IV-14 reports the results of LMM predicting mathematics achievement scores with student-level and school-level predictors. The parameters for student-level predictors ($\hat{\gamma}_{10}$ through $\hat{\gamma}_{80}$) provide the estimated slopes in the school that is coded zero for all school-level variables (i.e., urban, average percentages of FRL and students of color, and average school climate).

Note that those continuous measures for school and student characteristics (percentages of FRL and students of color, and school climate as well as a student's SES index score) were centered at the grand-mean for a meaningful interpretation of the intercept. For example, the estimated intercept for the regression of the random slope for SES ($\beta_{5j}$) indicates the estimated slope of the regression line for the regression of the math score on the SES in urban schools with average percentages of FRL, students of color (SOC), and average school climate ($\hat{\gamma}_{50} = 5.089$).

Table IV-14

*Parameter Estimates and Variance Components for Math Achievement based on LMM*

| | *B* | *SE* |
|---|---|---|
| Level 1: Student-level predictors | | |
| Black, $\hat{\gamma}_{10}$ | -2.795*** | .602 |
| American Indian/Alaska Native, $\hat{\gamma}_{20}$ | -3.218 | 1.706 |
| Southeast Asian, $\hat{\gamma}_{30}$ | 2.489*** | .678 |
| Other Asian/Pacific Islander, $\hat{\gamma}_{40}$ | 2.835*** | .698 |
| Socioeconomic status (SES), $\hat{\gamma}_{50}$ | 5.089*** | .291 |
| Intersectionality between Female × SES, $\hat{\gamma}_{60}$ | -0.738* | .310 |
| Intersectionality between Hispanic × SES, $\hat{\gamma}_{70}$ | -0.707 | .478 |
| Intersectionality between black × SES, $\hat{\gamma}_{80}$ | -2.106** | .708 |
| Level 2: School-level predictors | | |
| Suburban, $\hat{\gamma}_{01}$ | -0.552 | .296 |
| Rural, $\hat{\gamma}_{02}$ | -0.741* | .303 |
| Percentage of free or reduced lunch eligible students (PFRL), $\hat{\gamma}_{03}$ | -0.052*** | .006 |
| Percentage of students of color (PSOC), $\hat{\gamma}_{04}$ | 0.013 | .051 |
| School climate, $\hat{\gamma}_{05}$ | 0.919 | .536 |
| Cross-level interaction | | |
| Intersectionality (Hispanic × SES) × PSOC, $\hat{\gamma}_{74}$ | -0.271* | .105 |
| Intercept, $\hat{\gamma}_{00}$ | 51.785*** | .230 |

*$p < .05$, **$p < .01$, ***$p < .001$

In school-level predictors, the estimated regression coefficients ($\hat{\gamma}_{01}$ through $\hat{\gamma}_{05}$) are for the regression of the random intercept on school characteristics. In particular, the coefficient $\hat{\gamma}_{02}$ indicates the difference in the estimated mean intercepts (rural schools versus urban schools), which is statistically significant ($\hat{\gamma}_{02}$ = -0.741). Based on the grand-centered school characteristics, the estimated value of -0.741 represents that students with an average SES index score are expected to score 0.741 fewer points on the math test if they attend a rural school than if they attend an urban school. Furthermore, the significant coefficient for the percentage of FRL ($\hat{\gamma}_{03}$ = -0.052) shows the difference in the estimated mean intercepts with a one-unit change in the percentage of FRL students (PFRL) in a school.

Furthermore, the estimated intercept, $\hat{\gamma}_{00}$, for the regression of the random intercept, $\beta_{0j}$, on school characteristics ($\hat{\gamma}_{00}$ = 51.785) indicates that the estimated intercept for the regression of the math achievement score on students' race or ethnicity, gender, and SES as well as the intersectionality of these identities in urban schools with average FRL, SOC, and average school climate (SC) is 51.785. This number indicates the expected math achievement scores for white students with an average SES index score in urban schools with average PFRL, PSOC and SC. In addition, the estimated sum of the coefficients $\hat{\gamma}_{00} + \hat{\gamma}_{10}$ shows the expected intercept for black students with an average SES index score in the urban school with average PFRL, PSOC, and SC (51.785 - 2.795 = 48.99).

The cross-level interaction effect between organizational characteristics and intersectionality among multiple social categorizations was not statistically significant for Southeast Asian female students. This result indicates that the school organizational characteristics used in this study did not mediate or differentiate the

intersectionalities related to Southeast Asian female students. In other words, the patterns in educational outcomes for Southeast Asian female students held regardless of schooling context. The only significant cross-level interaction effect was observed among Hispanic students ($\hat{\gamma}_{74}$ = -0.271, $p < .05$), which illustrates the relationship between the intersectionality of Hispanic and SES in math achievement and school organizational characteristics. In particular, the coefficient of cross-level interaction indicates that the slope of the regression line in the regression of math scores on the intersectionality between Hispanic and SES differs significantly based on the percentage of students of color in a school. Due to the negative and statistically significant coefficient, the cross-level interaction indicates that a higher percentage of students of color in a school is negatively associated with the effect of SES for Hispanic students. This finding indicates that a low income Hispanic student who attends a school with a higher percentage of students of color will do better than other low income Hispanic peers in a whiter setting.

**Intersectionality in teacher's graduate degree and school characteristics**. This study used hierarchical logistical regression modeling (HLRM) to explore the relationship among intersectionality, school characteristics, and a teacher's graduate degree, which is a dichotomous variable. Table IV-15 reports the results of HLRM (the log-odds and exponential of these terms) for predicting whether or not a math teacher has a graduate degree relative to the intersectionality of race or ethnicity, gender, and SES and school characteristics. The parameters for student-level predictors provide the estimated slopes for *SES* ($\hat{\gamma}_{10}$) and the intersectionality between *Hispanic* and *Female* ($\hat{\gamma}_{20}$) in the school that is coded zero for all school-level variables (i.e., urban, average percentages of FRL and students of

color, and average school climate). Furthermore, the estimated intercept ($\hat{\gamma}_{00}$) is the average log-odds of whether or not a math teacher has a graduate degree across high schools in the U.S. In school-level predictors, the estimated coefficients ($\hat{\gamma}_{01}$ through $\hat{\gamma}_{05}$) are for the regression of the random intercept on school characteristics.

Table IV-15

*Parameter Estimates and Variance Components for a Teacher's Graduate Degree*

| | $\beta$ | $e^{\beta}$ (odds ratio) | *SE* |
|---|---|---|---|
| Level 1: Student-level predictors | | | |
| SES, $\hat{\gamma}_{10}$ | 0.089 | 1.093 | .081 |
| Intersectionality between Hispanic × Female, $\hat{\gamma}_{20}$ | -0.202 | 0.817 | .169 |
| Level 2: School-level predictors | | | |
| Suburban, $\hat{\gamma}_{01}$ | 0.300* | 1.350* | .135 |
| Rural, $\hat{\gamma}_{02}$ | -0.587*** | 0.556*** | .140 |
| PFRL, $\hat{\gamma}_{03}$ | -0.006 | 0.994 | .005 |
| PSOC, $\hat{\gamma}_{04}$ | -0.004 | 0.996 | .042 |
| School climate, $\hat{\gamma}_{05}$ | -0.346 | 0.708 | .473 |
| Intercept, $\hat{\gamma}_{00}$ | 0.077 | 1.080 | .124 |

*$p < .05$, **$p < .01$, ***$p < .001$

Note that Table IV-7, focusing on math teachers' graduate degree related to only student-level predictors, showed two statistically significant student-level logistic regression coefficients: SES and a interaction term between Hispanics and females. Including school-level predictors (Table IV-15), however, the student-level predictors (see Table IV-7) become statistically non-significant, and only two school-level predictors (suburban and rural schools) are statistically significant.

The predicted odds of whether or not a math teacher has a graduate degree for suburban schools associated with white male students having an average SES (reference student) with average school PFRL, PSCO, and school climate (reference school) are 1.350 times the odds for urban schools. Furthermore, the predicted odds of whether or not a math teacher has a graduate degree for rural or town schools associated with white male students having an average SES (reference student) with average school PFRL, PSCO, and school climate (reference school) are 0.556 times as great as the odds for urban schools. However, the school organizational characteristics do not mediate or differentiate the intersectionalities related to the predicted odds of whether or not a math teacher has a graduate degree for Southeast Asian female students.

# CHAPTER V: DISCUSSION AND CONCLUSION

Based on the theory of intersectionality, this study examined the association between the intersectionality among race or ethnicity, gender, and SES and students' educational experiences and outcomes. This study focused on Southeast Asian female students' educational experiences and outcomes to address the potential exclusion of the particular student group in education policy and research. This study further sought to identify school organizational characteristics that support or hinder the relationship among multiple intersectionalities and educational experiences and outcomes. The analyses addressed the three research questions that framed the study and illustrated research methods to identify intersectionality quantitatively. This chapter first summarizes the main findings. It then discusses the implications of the theory of intersectionality and education policy as well as the limitations of this study. Finally, it concludes with suggestions for future studies, focusing on intersectionality.

## Summary

Table V-1 presents the diverse intersectionalities that were significantly associated with students' experiences and educational outcomes; these associations were identified from the statistically significant interactions among race or ethnicity, gender, and SES. Student-level models indicated that each student experience and educational outcome was associated with different intersecting identities (see Table V-1).

Table V-1

*Significant Intersectionalities among Race or Ethnicity, Gender, and SES*

| Student experience and outcomes | Intersectionality | Related student group |
|---|---|---|
| 1. Math teacher's graduate degree | Hispanic × Female (+) | Hispanic females |
| 2. Quality of individual interactions | Black × Female (+) | Black females |
| with their math teachers | Hispanic × SES (-) | Hispanic males and females |
| 3. Math achievement | Female × SES (-) | All females |
| | Black × SES (-) | Black males and females |
| | Hispanic × SES (-) | Hispanic males and females |
| 4. Intention to enter higher | Southeast Asian × Female (-) | Southeast Asian females |
| education | Hispanic × SES (-) | Hispanic males and females |
| | Hispanic × SES × Female (+) | Hispanic females |

In terms of students' schooling experiences, Southeast Asian students are less likely to hold gender stereotypes regarding males' superior math abilities than are other race/ethnicity groups, regardless of gender. In addition, Southeast Asian female students perceived a higher degree of positive interactions with math teachers than the other identities considered. Focusing on math teachers' teacher quality measures, Southeast Asian students' math teachers did not have significantly different teacher quality compared to that of their white counterparts. Finally, the effect of SES on the quality of interactions with math teachers was positive for Southeast Asian female students. Thus, the higher SES a Southeast Asian female student has, the higher her perceived quality of interactions with math teachers. This pattern was not unique to Southeast Asian high school girls; that is, higher SES had a similarly positive

association on the quality of interactions with teachers for other race/ethnicity groups, except Hispanic students.

In terms of educational outcomes, math achievement scores of Southeast Asian students were significantly higher than those of other race/ethnicity groups, except Other Asian/Pacific Islanders, regardless of gender. However, even though the math achievement of Southeast Asian females was not significantly different from their male counterparts, their intention to pursue higher education was significantly lower than that of Southeast Asian males. This intention was also the lowest among all female students. In particular, the odds of intending to enter higher education for a Southeast Asian female student is 0.45 times the odds for three other groups (Southeast Asian males, males who are not Southeast Asian, and females who are not Southeast Asian). Furthermore, the probability that Southeast Asian females with average SES intend to enter higher education institutions is low at $p = .353$. Thus, despite performing well in math relative to their peers, Southeast Asian female student were less likely to pursue higher education.

The influence of SES on Southeast Asian female students' math achievement scores was not statistically different from the average impact of SES on math achievement scores for all students. This finding for Southeast Asian female students does not hold true for other students groups. In particular, SES matters less for the achievement of black females than it does for both black males and for whites overall. Similarly, SES matters less for Hispanic females' math achievement scores than it does both for those of Hispanic males and of whites overall.

This study also found that the school characteristics used in this study do not mediate the intersectionalities related to Southeast Asian female students. In other words, the patterns described above held regardless of schooling context.

## Discussion

This section discusses implications related to the knowledge of intersectionality. In addition, it considers the implications of the association between school organizational factors and the intersectionality of race or ethnicity, gender, and SES. Finally, this section concludes with implications for education policy and leadership.

### Intersectionality Focusing on Southeast Asian Females

As the idea of intersectionality is historically and theoretically rooted in feminist theories, the primary objective of research based on intersectionality theory or framework typically focuses on differences and commonalities in women's lives. By differentiating experiences of women of color from white women, intersectionality studies seek to identify diverse patterns of inequalities originating from multiple identities.

Based on theories of intersectionality, this study explored diverse schooling experiences and educational outcomes of Southeast Asian female students. It found that math achievement scores of Southeast Asian students were significantly higher than those of other race or ethnicity groups, except Other Asian/Pacific Islanders, regardless of gender. However, even though the math achievement of Southeast Asian females was not significantly different from their male counterparts, their intention to pursue higher education was significantly lower than that of Southeast Asian males as well as being the lowest among all female students.

As intersectionality and CRT scholars argue, institutionalized oppressions may be significant for explaining inequality in Southeast Asian female students' intentionality related to higher education. That is, different intersecting institutionalized oppressions and privileges based on the unique race or ethnicity,

cultural beliefs related to gender categorization, colonization, and indigeneity of Southeast Asian females may create significant inequality. Based on their unique historical backgrounds as immigrants or refugees, Southeast Asian female students may live within in-between worlds (DeLeon, 2010; Ngo, 2009). The concept of middle ground suggests that people living in the spaces between cultures and multiple social categorizations (i.e., Southeast Asian females) often experience dynamic inequality and social division in terms of their relationships with each other. For example, educational policy and practice confirming postcolonial superiority in the United States make Southeast Asian students struggle to adapt to existence in the middle ground, which is between the ethnic homelands culture of their parents and the colonized culture (Ngo, 2013). Of course, even when institutionalized multiple oppressions are critical external forces affecting Southeast Asian female students' lower intentionality for higher education, more mediated oppression also plays a role. For example, Khalifa and his colleagues (2014) argued that colonizers utilize a variety of stereotypes toward people of color and indigenous people (e.g., model minority stereotypes) as a tool for positioning colonizers' power and normalizing their hegemonic positionality.

Furthermore, the unique cultural norms and values for the roles of girls can amplify the external forces for Southeast Asian female students in the conceptual space of middle ground based on racial or ethnic and gender categorizations. In particular, Walker-Moffat (1995) found that parents' relatively lower educational expectations for their daughters create particular challenges for Hmong girls. Furthermore, the cultural pressure for Cambodian girls to comply with traditional gender norms in their home culture (e.g., early marriage, having a baby) is a significant factor for Cambodian girls' educational outcomes (Ngo & Lee, 2007).

Although patriarchal structures at home and school might also affect white, Latina, and black students, the particular positionality of Southeast Asian females in the middle ground based on multiple social categorizations can create their unique lived experiences and inequality in their pursuit of higher education.

**Intersectionality Focusing on SES**

Although intersectionality studies focusing on SES are still under-explored (Knapp, 2005), scholars have emphasized the influence of SES in the interplay of diverse identities. This study also demonstrated the influence of SES in creating different intersectionalities. In particular, in terms of a student's math achievement, the influence of SES was different between males and females among Southeast Asian students. This study found that SES matters less for the achievement of Southeast Asian females than it does for both Southeast Asian males and for whites overall. Furthermore, this study found Southeast Asian students are experiencing same advantages from SES in the quality of individual interactions with their math teachers and math achievement that white students with higher SES do. This pattern does not apply to Hispanic and black students. In particular, Hispanic students are not experiencing the same benefits from SES in the quality of individual interactions with their math teachers and math achievement that other race or ethnicity groups with higher SES do. Similarly, higher SES black students are not experiencing the same advantages in math achievement from SES that other race or ethnicity groups with higher SES do. The findings in the current study may suggest that Hispanic or black parents from a high SES background might be limited in their access to the financial, inter-social, and informational resources available to contribute to their children's achievement in math. Another potential explanation of this finding might originate from neighborhood effects (e.g., Sharkey, 2013; Sirin, 2005). That is,

Squires (2017) found that the concentration of affluent white population is more significantly prominent than that of affluent black population in the United States. Due to stronger neighborhood concentration of white population from higher SES, black and Hispanic students from higher SES might live in neighborhoods with less concentrated wealth, thereby they might not have similar neighborhood effects from resources and social networks.

The influence of SES on Southeast Asian students' schooling experiences and educational outcomes was not different between males and females. This pattern does not hold true for other race or ethnicity groups; that is, gender mattered for the influence of SES among the other racial or ethnic groups. In particular, in terms of a student's intention to pursue higher education, the influence of SES was different between males and females among Hispanic students. This study found that the predicted probability of the pursuit of higher education for Hispanic female students from the highest SES was similar to that of black female students from the same SES, which was the highest group. By contrast, the predicted probability of intending to pursue higher education among Hispanic males from the highest SES was the lowest among males in the highest SES. These patterns were significantly different from those of Hispanic students from the lowest SES. In particular, the predicted probability of intending to enter higher education for Hispanic females from the lowest SES was significantly lower than that of Hispanic males as well as that of black, white, and Other Asian/Pacific females.

**Intersectionality and School Organizational Contexts**

Intersectionality scholars often emphasize the importance of organizational contexts and the role of organizations in creating different life opportunities (Núñez, 2014). Incorporating organizational factors into the interplay among individual-level

intersectionalities can illuminate "a comprehensive picture, providing the best chance for an effective diagnosis and ultimately an effective prescription [for educational inequity]" (Hancock, 2007, p. 73). Although this study found that Hispanic students experienced different class inequalities based on the percentage of students of color in a school, there was no significant association between school characteristics and inequities that Southeast Asian female students experienced in educational outcomes. This finding shows that the school characteristics used in this study (i.e., community type, percentage of FRL students, percentage of students of color, and school climate) do not mediate or resolve inequalities in educational outcomes (i.e., math achievement). In addition to this finding, critical quantitative researchers should continue exploring what other school characteristics (e.g., leadership, school-level policy) could mediate inequities across school organizations through rigorous quantitative studies. With such concerted efforts, policymakers and school leaders should be implementing policy strategies and exercising leadership to address inequities that Southeast Asian females are experiencing, which will be specifically discussed below.

**Implications for Gender Stereotypes**

This study focused on STEM subjects for students' achievement score and educational experiences, reflecting women's underrepresentation in STEM careers (e.g., National Science Foundation, 2008). Scholars have found that women are underrepresented in academia, leadership positions, and business, depending upon the field and their specific roles. Considering a potential factor for women's underrepresentation in STEM fields, this study explored the gender stereotypes about males' superior math abilities, particularly how multiple intersecting identities are associated with gender stereotypes.

The results indicated that gender stereotypes are associated with students' SES, gender, and race or ethnicity. In particular, Southeast Asian students are likely to have lower gender stereotypes about males' superior math abilities than are other race or ethnicity groups. Thus, Southeast Asian females do well academically and are less biased about their ability, but they do not necessarily plan to go to college. Furthermore, students with higher SES are more likely to subscribe to the gender stereotype that males are better in math and males are more mathematically inclined than females. Similarly, male students are more likely to have gender stereotypes about males' superior math abilities than their female counterparts. Bench, Lench, Liew, Miner, and Flores (2015) also examined the difference of undergraduate college students' *positive bias*, reflecting that males are more likely to overestimate their ability in math than females. Their finding was not to say that females underestimated their math ability more than males; it is about males' overconfidence, rather than females' underconfidence. They also demonstrated that the males' greater overestimation of their math ability is associated with their greater pursuits of math-related careers. Although Bench et al. identified patterns of males' greater overestimation of their ability than their actual performance, the current study focusing on high school students found that males are also more likely than their counterparts to believe the stereotype that males are better in math than females. The next section offers specific implications for policy and leadership related to these findings.

**Implications for Policy and Leadership**

One important component in intersectionality studies is the pursuit of transformative policy efforts to realize social justice (e.g., Collins, 2007; Dill & Zambrana, 2009). Intersectionality scholars emphasize such transformative actions to

meet diverse and unique needs of students originating from their positionality on the intersections among race or ethnicity, gender, and SES. Furthermore, intersectionality thinkers highlight the importance of school or university leaders' leadership in creating more inclusive organizations (e.g., Gooden, 2015; Patel, 2016). In particular, Patel underscored that university leaders should support educators to appreciate and engage across students' race or ethnicity, SES, gender, nationality, religion, and sexual orientation to establish support systems that meet students' diverse needs.

Ngo (2006) argued that Southeast Asian students' pursuit of education is closely related to the needs of their families and they are often marginalized in education policy due to the model minority myth based on the story of Asian Americans' success in the United States. Education policy from a unidimensional approach to improving college access might have only a very limited effect for Southeast Asian female students. In particular, typical education policies meant to encourage the pursuit of post-secondary education options will not work for Southeast Asian girls. Rather, the findings of this study suggest the need for educational strategies that are unique to Southeastern Asian girls and different from those employed for other girls or for Southeastern Asian boys. In particular, different solutions can support Southeast Asian female students based on Jones's (2000) categories of oppressions. For example, policymakers might use professional development opportunities and capacity building for educators, school counselors, and leaders to engage in ways of addressing personally mediated oppressions (e.g., tackling the myth of the model minority stereotype). In addition, policymakers and educational leaders as social justice leaders should focus on addressing multiple forms of structural oppressions in their organizations and society, which may enable

Southeast Asian female students to realize their potential in schools. As Capper (2015) appropriately emphasized, policymakers and school leaders "must guard against the ways that unifying policies and practices across differences can reproduce racism, [classism, sexism, and the corresponding intersecting multiple oppressions]" (p. 822). Using social justice–oriented inquiries, researchers should also engage in destroying multiple oppressions and advancing equity in education. Critical quantitative researchers, in particular, utilize numbers and statistical inferences to reveal these multiple structural inequalities that are deeply associated with power relations among different social categorizations. In this regard, critical quantitative researchers have an essential and powerful role in creating conditions of equity that attend to intersectionality: they can inform and alarm policymakers and school leaders about structural inequalities as well as realize educational equity and social justice.

## Conclusion

### Limitations and Future Study

There are three key limitations of this research that need to be discussed. First, this study was not able to reveal mutually constructing systems of power that Southeast Asian students experience in schools as this study used existing surveys. Furthermore, using fixed categories of diverse identities in surveys limits the ability to illustrate the complexities related to unfixed identities. For example, scholars typically argue that race is "an unstable and de-centered complex of social meanings constantly being transformed by political struggle" (Omi & Winant, 2014, p. 19). In addition, most social scientists argue "race is a social construct that has both self-prescribed and externally ascribed meaning"; further, race in the United States has had "more social and political meaning than biological reality" (Howard, 2015, p.

96). This study delimits race or ethnicity from data based on students' own perceptions about their racial status. Furthermore, although the number of Americans who classify themselves as mixed race is increasing according to recent U.S. Census reports (Aumer, Hatfield, Swann, & Frey, 2011), this study has the limitation that it is not able to consider multiracial status in this analysis. Note that the percentage of the total population in 2010 who self-identified as mixed race remains relatively small (2.9%) according to the U. S. Census Bureau (2012). Finally, this study used fixed binary gender identities (males versus females). This is because the dataset used in this study as well as other nationally representative quantitative datasets (e.g., Census, National Center for Education Statistics) typically do not specify other gender categorizations including transgender and gender nonconforming (TGNC) (Rider, McMorris, Gower, Coleman, & Eisenberg, 2018). Thus, the quantified gender categorization in this study is limited and does not reveal inequalities among TGNC students, which is beyond the scope of this study.

Second, this study delimits the exploration of intersectionality by focusing on three identities: race or ethnicity, gender, and socioeconomic status. However, intersectional frameworks suggest expanding the perspective beyond these identities to other historically marginalized student identities (e.g., students with disabilities, students who are linguistically diverse). For example, minority statuses based on students' sexual orientation (i.e., lesbian, gay, bisexual, and transgender) were not considered in this analysis. The reasons for choosing three identities (race or ethnicity, gender, and SES) in this study are as follows: (1) intersectionality scholars often argue, race or ethnicity, gender, and SES are "the most obvious, pervasive, and seemingly unalterable [in the US]" (Shields, 2008, p. 303); (2) a quantitative study focusing on more than three identities might confront critical statistical issues (e.g.,

the lack of enough samples having four marginalized identities, the complexity of examining four-way interaction in statistical analyses); and (3) nationwide datasets mostly do not include information about students' sexual orientation. Thus, this study will not illustrate the school experience of students with marginalized identities beyond their race or ethnicity, gender, and SES.

Finally, this study has limited generalizability to other subjects (e.g., reading or social studies) because this study focuses only on students' math achievement scores. Intersectionality patterns related to reading achievement may differ from achievement patterns in STEM subjects (Autor et al., 2015). In addition, this study has limited generalizability to elementary and middle school levels because this study investigates the intersectionality of students' multiple identities in students' school experience, characteristics, and outcomes in U.S. secondary schools. Students' experiences and school characteristics in secondary schools in the United States are often different from their experiences in elementary and middle schools (e.g., Topping, 2011).

In order to address these limitations and expand the knowledge related to intersectionality, future research is warranted as follows. First, future research needs to utilize qualitative anecdotes to complement the quantitative findings of this study and enrich the knowledge of nuances and complexities based on the intersectionality of race or ethnicity, gender, and SES. Furthermore, future research should expand intersectionality inquiries by including other identities that can perpetuate marginalization and exclusion in education (e.g., immigration status, limited English proficiency, sexual orientation). In particular, scholars have emphasized the importance of language as a critical means of social reproduction and marginalization resulting from structured inequity against students from diverse

linguistic backgrounds (Lee, 2009; Ricento & Wiley, 2002). Phillipson (1999) contended that the growth of English is related to "a critical endorsement of capitalism, its science and technology, a modernization ideology, monolingualism as a norm… the Americanization and homogenization of world culture, and linguistic imperialism" (p. 274). Lee (2009) further demonstrated how the use of minority students' indigenous language within their homes creates hybrid identities and explored the effect of this hybrid identity on their school experiences. Thus, future investigations focusing on the intersectionality related to home language use (or limited English proficiency) can show the underexplored patterns of educational inequity and suggest adequate policy alternatives to support students who need more support.

Future research should also explore how macro-level policies (e.g., immigration policy, language policy) can create different patterns related to intersectionality among multiple identities. Taking into account the political climate and policy stream can unearth broader interlocking oppressions and systems of power that change over time and differ by specific geographical regions.

**Contribution of this Study**

As a critical quantitative research, this study provided policy implications and leadership preparation by answering critical questions related to the complexity of students' experiences. This study specifically challenged the model minority stereotype related to Asian populations and differentiated the school experiences and educational outcomes of Southeast Asian students in the United States. Although the model minority stereotype toward Asian students suggests that they are the most likely to pursue higher education, this study demonstrated that Southeast Asian females have the lowest intention (among females) to pursue higher education. The

model minority stereotype reveals a larger systemic failure to consider the specificities within the Asian population, which limits the provision of adequate support for Southeast Asian females to realize their full potential through their future academic careers. Furthermore, by exploring nuanced differences among female students focusing on Southeast Asian students as well as other women of color, this study made understudied groups in education policy more visible and answered the critical question of whose voices are still unheard. The findings of this study can help policymakers to design better support for students so that students do not feel "strangers in a strange land" (Bell, 1970, p. 540). Finally, filling in the gaps in the literature on intersectionality broadened the research perspective aimed at social justice—a morally crucial goal.

Finally, this study's unique contribution to the literature and educational leaders lies particularly in the knowledge generated by exploring the relationship between different levels of structure (i.e., individual and organizational levels) and students' experiences and outcomes. The current literature that uses the intersectionality framework or theory often focuses only on individual identities, rather than organizational structure. As this study seeks to identify how the convergence of intersecting identities affecting individuals' experience and educational outcomes differs by organizational characteristics, the findings from this study will be important for educational leaders to create more just schools.

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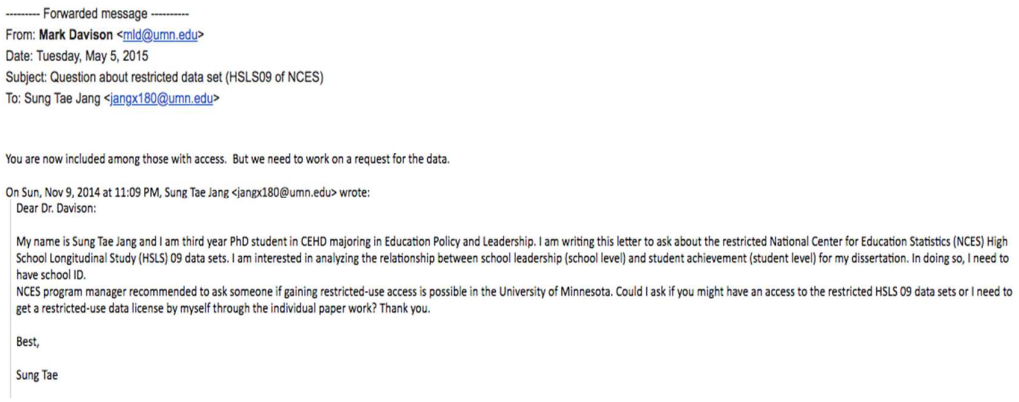
## Appendix. Institutional Review Board (IRB) Approval

This study is conducted by the IRB approval (study number: 1702E08361). The email showing a letter of approval to use the CD for the restricted-use HSLS:09 dataset after Dr. Mark Davison sent a request to get the CD from National Center for Education Statistics (NCES) is below.



--------- Forwarded message ---------
From: **Mark Davison** <mld@umn.edu>
Date: Tuesday, May 5, 2015
Subject: Question about restricted data set (HSLS09 of NCES)
To: Sung Tae Jang <jangx180@umn.edu>

You are now included among those with access. But we need to work on a request for the data.

On Sun, Nov 9, 2014 at 11:09 PM, Sung Tae Jang <jangx180@umn.edu> wrote:

Dear Dr. Davison:

My name is Sung Tae Jang and I am third year PhD student in CEHD majoring in Education Policy and Leadership. I am writing this letter to ask about the restricted National Center for Education Statistics (NCES) High School Longitudinal Study (HSLS) 09 data sets. I am interested in analyzing the relationship between school leadership (school level) and student achievement (student level) for my dissertation. In doing so, I need to have school ID.
NCES program manager recommended to ask someone if gaining restricted-use access is possible in the University of Minnesota. Could I ask if you might have an access to the restricted HSLS 09 data sets or I need to get a restricted-use data license by myself through the individual paper work? Thank you.

Best,

Sung Tae